NAGPUR
Agricultural College Magazine

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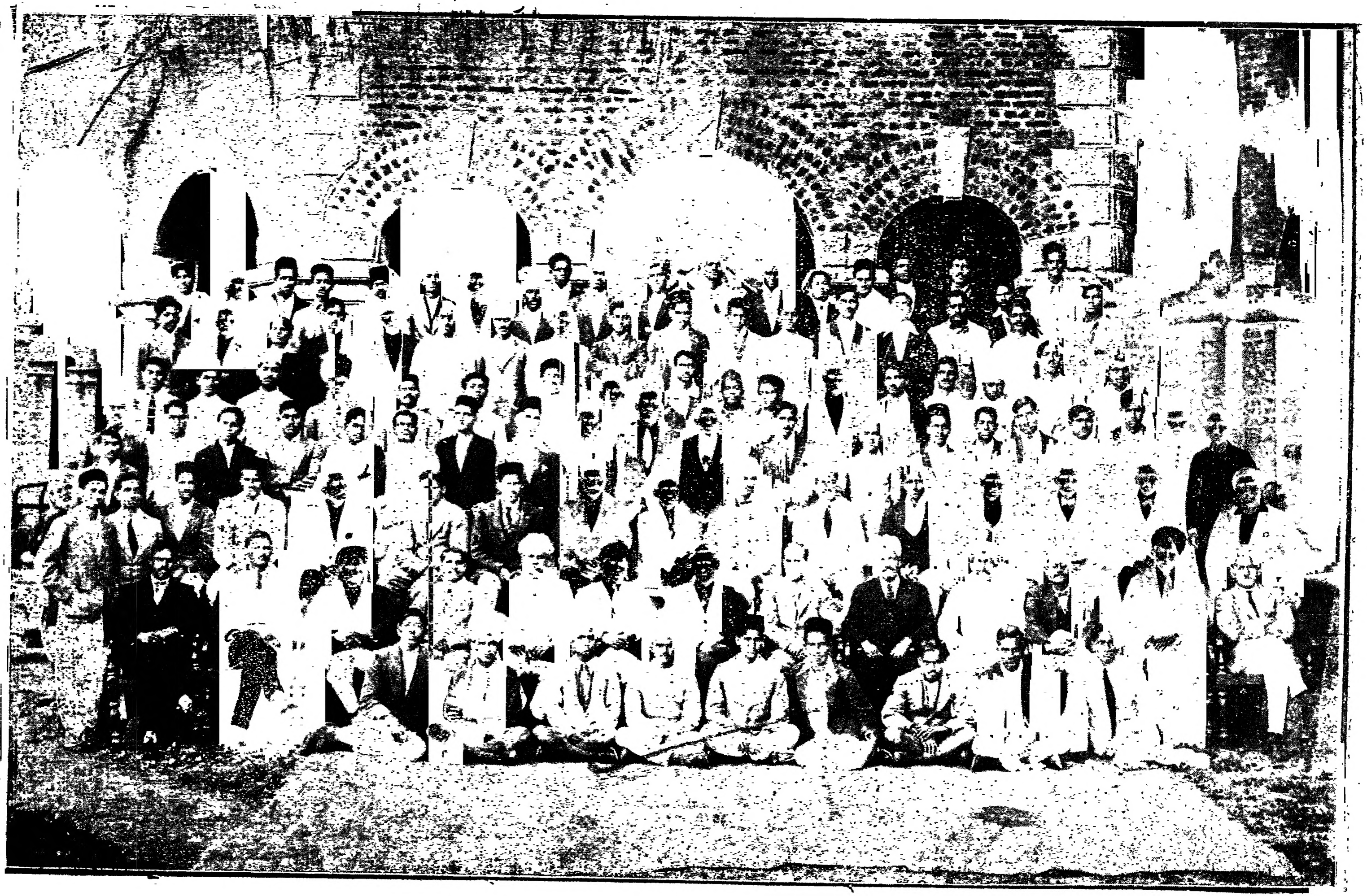
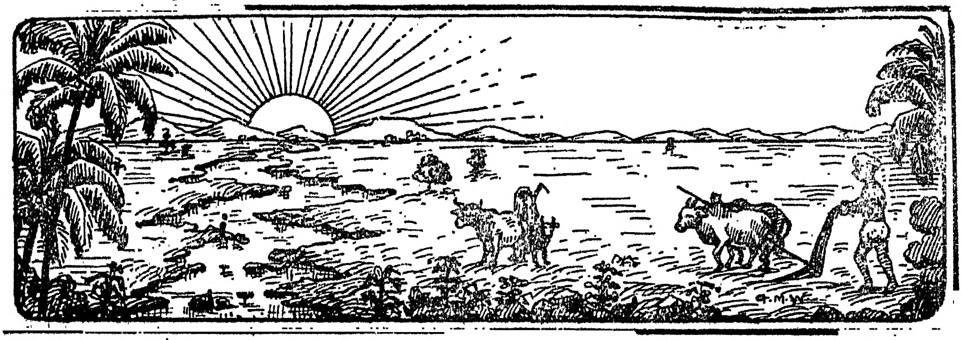


Agricultural College Social Gathering 1925.

Agricultural College Magazine.



To make two blades of grass grow in place of one is the immediate need of India.

Vol. I. *MARCH 1926.* *No. I.*

EDITORIAL.

Our object.

With the New Year's Happy greetings we are glad to place the first issue of the Agricultural College Magazine in the hands of our readers. This is only a revival of the old College Magazine, and the idea is in no way a novel one in the history of this institution. We are only taking up the thread of work where our worthy predecessors left it.

In one respect at least, there is a departure from old traditions. It is a students' Magazine—managed financed and fed by the students. The recent affiliation of our college to the university created a desire of having a magazine of our own which may serve as a connecting link between the present and the past students. The speed with which the proposal was translated into action and the large number of contributions that were received from the students serve to show their great enthusiasm and keen interest.

Yet the venture of a magazine of this kind is rather a bold one. It .nnot be undertaken with a light heart or without much diffidence. [ost of our students have a scanty knowledge of English and others who [ten write do but amatuerish work showing little insight into he science of agriculture and its allied subjects. The difficulty, herefore of securing regularly a supply of good, sensible and well written ontributions appears to be almost insuperable. Counting, however upon the ;ood will and kindness of the few well wishers of this magazine and the o-operation of the various experts of the department, we launch upon this lifficult journey.

India is an agricultural country and in its agriculture, lie its treasure ınd its strength. It is to agriculture and its scientific development we must look for solution to many of the economic and the social problems which confront us today. For the well being, political progress and general prosperity of the Indian nation, material wealth is an essential and indispensible condition. India must acquire this material wealth by expanding and improving her principal industry agriculture and this can be achieved only if educated India goes to the rescue of agricultural India, as an actual worker, a teacher, a practical demonstrator and a fellow labourer. If cultured young men improved the country's agriculture on scientific lines, there will necessarily follow material advancement of the country and the people. A new spirit will be infused into Indian cultivation. Diseases such as plague, influenza, cholera, smallpox will be successfully checked, distress of famine and scarcity will be lessened., the strain and competition in the over crowded professions will be eased.

Our principle object, therefore, is to help the spread of scientific knowledge of agriculture among the people in general and students in particular, to implant liberal thoughts in them, to create in them a love for the green fields and the flowing brooks, for the charms and advantages of a healthy buoyant life in the very bosoms of nature, to eradicate the common impression among young students that agriculture is a mean vocation and ploughing and sowing and reaping are tasks reserved for the Gawanrs, the rustics, to force them to set aside false concept and false pride and to take up the yoke—the only yoke which is no yoke. We request our comrade-in-arms to extend us their hands of fellowship and beseech our critics to judge us charitably, if we fall short of their expectation.

The Affiliation of the College to the university.

The most outstanding event of the year was the affiliation of our college to the university of Nagpur. As a result we have already begun to attract a large number of students. It seems the impression that ours is a Bakkhar college is fast disappearing. If we progress at the present rate we shall ere long be numerically as strong as any of the Arts Colleges.

The Principal, Messrs. Mehta, Aiyyar, Khare, Phatak, Shrivastava and Kayastha represent us in the Board of Studies in their respective subjects and Messrs Phatak and Ramnarayan have been elected as members of the university Court. To all of them we offer our hearty congratulations. We welcome Mr. D. N. Mehta a personality in our college and his second in command Mr. G. S. Bhatia who come to us from England and Punjab respectively. Other changes are too numerous to mention. Mr. Karkarey comes to us as a whole time Lecturer in English in place of Mr. Hirde Narain of the Morris College.

The Social Gathring of 1925.

Elsewhere will be found an account of this year's brilliant Gathering. Among the notable guests were Sir B. K. Bose the grand old man of Nagpur, Honr. Mr. Martin and Mr. F. J. Plyman our Director, Messrs. F. K. Clark and T. W. Gardiner. As usual we began with the Hindi drama 'Oospar'which attracted an unmanagably huge audiance. Marvellous enthusiasm in sports displayed by the past students was a feature of this year's Gathering.

Some extracts from selected English plays which we staged were highly appreciated by the large number of European spectators. We are proud in having one of the best actors and stage directors in our Principal, Mr. R. G. Allan. Among our lady guests were Mrs. Allan and Mrs. Mehta who continued to be with us throughout the Social Gathering.

THE ADVANTAGES OF SOILING,

SOILING—that is, cutting the green crop and feeding it to stock–is far more economical than pasturing for all kinds of live stock. Animals grazing on lucerne generally destroy far more than they eat by trampling down the fodder. Various estimates are given of the increased number of animals which can be carried on a given area by this method, several authorities stating that from three to six times as many head of stock may be maintained by soiling as compared with grazing. The advantages claimed for soiling over grazing may be summed up thus:—

1. It saves land.
2. It saves fencing.
3. It economises food.
4. It keeps cattle in better condition and greater comfort.
5. It produces more milk.
6. It increases the quantity and quality of manure.
7. There is greater docility and discipline of animals.
8. There is less breaking of fences.
9. It ensures regularity of feeding and output.

Agriculture in Ancient and Mediaeval India.

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The Greeks were the invaders and conquerors in the country now known as Greece. They reduced the original aborigines to bondage and imposed upon them the labour of cultivating the soil and hence both the occupation and those engaged in it were regarded contemptuously by the dominant race Therefore, the unrivalled literature of Greece affords little information regarding the practical details of her husbandry. But the Vedas and other later works in India abound in reference to agriculture in those ancient times. It would therefore be interesting to know how we tilled in those days and sowed and reaped, what crops we cultivated and by what methods we converted them into food and raiment.

'Agriculture the best, Trade the next and Service the worst', runs a famous Indian adage which shows that agriculture was highly esteemed and pursued with an earnest love and devoted attention in India. The God Sun is represented to have said.

'Ye Gamblers, believe in my words, give up playing at dice. Adopt farming as your profession and enjoy the resulting wealth in grain and cattle. Herein only, will be found wealth and family bliss.' The Indians were exceedingly covetous of land for it was in land that their principal wealth consisted. They were as they continue to be a thoroughly agricultural people and it was only at a later period that commerce, trade and arts were introduced amongst them and even then they occupied a subordinate place.

Except in purely barbaric age, the wealth of the earliest inhabitants of this country consisted mainly of cattle and their chief food was flesh and milk. Even today it is not hard to find the representatives of this class of people. The life of the Rubbars, Bharwads and Charans of Guzerat, Banjaris and Khilas of the Satpura districts gives us a picture of those nomadic times. As society progressed and civilization advanced 'Kumari' or 'Dali' form of cultivation came into vogue which meant that the people burnt the jungles and used the ash to increase the productivity of the soil. This system obtains in the hilly districts of southern India even now. The next step in agriculture was reached when the nomads settled down permanently on certain lands and started cultivating them year after year,

The earliest occupation of the Indians, agriculture or Krishi Karma as it is called in Sanskrit is derived from the root Krisha which signifies ploughing. It follows therefore that the plough is the most important factor in agriculture and is the chief of all the agricultural implements. A stick seems to have been the original form of which the plough is a development. A stick must have been rejected in favour of a pickaxe which was possibly replaced by the Modern Indian plough. The following old verse describes the various requisites of the Indian agriculture.

'May the oxen yoked to the plough, plough the field well. May the plough and husbandman perform their duty with pleasure. The rope round the neck of the oxen be tied in a way not to be troublesome to the bullocks. May the goading stick be made use of only when absolutely necessary. May the breast plate of the plough, plough the field well. May the farmer treat the bullocks kindly and drive them with pleasure. May there be a useful and a happy rainfall.'

The term agriculture was never used in the wide sense in which it is used now. In India before the advent of the British, all that it meant was the cultivation of periodical crops, garden produce and horticulture and all the information that can be had deals more or less with those topics. The Chroniclers of Chandra Gupta Maurya have carefully recorded annual rainfalls, and account of various crops harvested in various seasons. Vriksha Ayurveda an agricultural handbook of those times goes so far as to tell us that in summer the plants in the flower pots should be watered morning and evening and during rains only in the evenings if the soil be dry. It tells us further that it is better to water the plants from the top so as to wash the leaves and branches than to water them at the roots.

The Bone manure, fish manure, the night soil manure (Poudretta) and rice water are described in the same book as very good fertilisers. They are regarded as curative agents in a number of plant diseases in which plants get stunted. The night soil manure, clarified butter, bone manure and river deposit are recommended as giving better retentive strength to the trees which drop down their fruits prematurely. Various pulses and sesamum are said to possess the same regenerating effect.

'If your trees drop their fruits before they mature,' says Vriksha Ayurveda, 'get crushed dung of sheep and goats, powder of Sesamum and barley, mix them with cattle blood ghee and water and use the solution.'

The same author tells us that grain seed should be sprinkled with green vitriol before sowing. Rose cuttings and cuttings of similar plants

should be well anointed with a solution made of honey, ghee, pig tallow and night soil manure before they are put in the nursary bed. Similar instructions have been given for trees and plants of various classes like peepal and bunyan potato and sugar cane. The handbook referred to above will be found to contain instructions as to the particular trees to be planted in particular places. Creepers for instance, says, the Vriksha Ayurveda should be planted in soil beyond the reach of floods. Gram should be sown in soil which is damp with flood water which is also the proper place for the cultivation of onions, ginger and the like.

Kautilya, the celebrated Indian Economist advises the cultivator to wash all corn before sowing, in gold water and recite the following prayer while sowing. 'I salute thee Lord Kashyapa. May the goddess of farming be pleased to favour me with corn and cattle.' In his famous book the same writer observes that under Hindu Kings, there was a separate department of agriculture with a complete hierarchy of Officers, each sub-department with its respective head. Not only that, the king's primary duty was towards the agriculturists the most important class of the subjects. The following words put in the mouth of Narada well illustrate the duty of Kings in times of yore.

'O King, says Narada to Yudhishtir, Are the cultivators of thy kingdom happy and contented? Is there sufficient storage of water in the wells, tanks and canals of thy kingdom or is it that the farmers are dependant on the vagaries of uncertain rainfall. The development in the art of gardening took place in India under tne Muslim rulers, some of whom like Babar and Akbar had a passion for it. But the cultivation of crops like rice, wheat, grain, pulse, cotton and fruits such as nuts cocoa-nuts, pomegranates mangoes, Jackfruits were known in India several thousand years ago. Mention is made of most of these products in the works of Vagbhatta who lived in India about 3000 years ago. The sugar cane cultivation and the several processes of making gur and Sugar were known to the Hindus even in the Vedic age.

Fruits however, like chikco and mangoes of better quality were introduced in India by the Portugese. Coffee is said to have been brought to India in about 1600. Tobacco cultivation was started in the time of Jehangir. History tells that India exported sugar to European countries until very recently and in the seventh century, a chinese emperor deputed students to India to learn sugar manufacture. In mediaeval times this country carried on a lucrative trade with foreign countries, in Calico and Dacca Muslim.

The Muslim rulers maintained several cattle breeding and camel breeding stables. The Peshwas had, at Alegaon in Poona district a stable for horse breeding.

In times when warfare was the general rule and peace an exception both the Rajput as well as the Muslim rulers tried in their own way to effect improvements in agriculture. Feroz Tughlugh tackled in a serious way the irrigation problem of Northern India. There are still extant large bunds and tanks constructed in the time of Hindu rulers in Nasik, Telingana, Gujrat and Karnatik. The reputed revenue minister of Akbar put a stop to the farming system and effected a settlement for a fixed term of years. Malik Ambar started temporary settlement in the Deccan. Ain-i-Akbari tells us of the state help given to the distressed ryots in the form of seeds, cheap grains and cooked food. Special concessions were given by Shivaji in order that the cultivators might make improvements on land, purchase good seed, sink wells and possess better bullocks.

The principle of Co-operation could be seen working in the daily life of the village farmer. He could get a loan at a cheap rate of interest from his sympathetic Malguzar and member of his own caste. The village Panchayats performed the most important task of facilitating collection of the land revenue The fields of poor cultivators were tilled by fellow cultivators showing the sympathy and good will that reigned supreme in ancient Indian Villages.

THE INFLUENCE OF CLIMATE AND MANURE ON GINNING PERCENTAGE AND THE LENGTH OF STAPLE OF COTTON IN CENTRAL PROVINCES AND BERAR.

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(V. P. L. Moodliar)

Introduction

Cotton occupies a unique position amongst the cultivated crops of the world. In the history of agriculture no other crop has received a greater stimulus for expansion and improvement than cotton. The cotton growing industry has an important significance in Indian agriculture. India is the second largest cotton growing country in the world. She is also a leading cotton spinning country in the East and stands fifth amongst such countries of the world. Besides, cotton is one of the most important articles of her export and the total area under cotton in 1921-22 was 11665395.

Of all the provinces of India, Central Provinces ranks second in cotton production, the first being Bombay. The total area under the cotton

crop in the Central Provinces and Berar is 4414148 and in Bombay, it is 6193000. There is no other part of India which has allotted such a large proportion of the cultivated land to the cotton crop as the Central Provinces and particularly Berar, which is essentially a cotton tract.

Percentage of area cropped under cotton.

Berar	40 to 60
Nagpur, Wardha and Yeotmal	20 to 40
Chanda, Chhindwara, – Narsingpur and – Hoshangabad.	5 to 20
Rest of C. Ps. . . .	0 to 1

Then again, the biggest cotton spinning and weaving mills of India are situated in the Central Provinces employing a fair number of her population. Thus, it is evident, that next to cereals, cotton is the only crop which is so intimately associated with the welfare of the Rayat of these provinces. Unfortunately the bulk of the cotton produced in the Central Provinces and Berar is mainly exported and very little is consumed by the local mills. The disability of the mills to use this cotton is due to its short staple. The cotton grown in Central Provinces and Berar is chiefly a mixture- known locally as Jadi, and a little of Bani (Gossypium indicum) found specially in Wardha and Chanda districts. Jadi cotton is mostly a mixture of different varieties of Gossypium neglectum-

G. neglectum malvense (staple 6/8th to 7/8th inches ginning percentage 25)
G. „ verum („ 5/8th to 6/8th inches ginning percentage 30)
G. „ Roseum („ 4/8th to 5/8th „ „ percentage 40)
G. „ Cutchicum („ 4/8th to 5/8th „ „ percentage 38)

This mixture is preferred by the cultivators because of its high yield and greater ginning percentage than other cottons of fine staple. At present, due to the unsatisfactory condition of cotton trade in India, it is paying to grow Jadi and particularly Rosea. Bani, inspite of its long staple (1 to $1\frac{1}{8}$") is not so paying because its yield and ginning percentage are low and hence it brings a low premium to the cultivator. The climatic conditions of Central Provinces and Berar are adverse to the cultivation of longer staple cotton. The introduction of longstapled exotic cottons has so far proved of little success. Efforts were then made to evolve out of the existing varieties of cotton a type most suited to the local climatic conditions and Rosea though short stapled. was recommended being the best yielder. Cross breeding is also being attempted in order to bring out a suitable cotton for this tract, but until any remarkable results are achieved, Rosea will form the bulk of the cotton produced in the Central Provinces and Berar. An attempt has been made here to find out the influence of climate and manure on the length of staple and ginning percentage of cotton in the Central Provinces and Berar.

Climate.

The successful cultivation of cotton needs definite climatic boundaries, established primarily by temperature, although the amount of rainfall and soil-conditions also influence it to a remarkable extent.

Cotton requires a moderate but regular supply of rainfall, hence light and frequent showers with plenty of sunshine in between, will produce the best conditions for its growth. Excessive heat causes the cotton to attain maturity too quickly, the bolls open before they are fully developed, the fibre becomes short, irregular and harsh. On the other hand, excessive rain prevents the important and natural process of ripening and opening of bolls. The fibre does not ripen properly and gets stained if it is allowed to stand exposed to rain. The climate of the Central Provinces and Berar is as characteristic as their soil. The soil of the Western portion including Berar is heavy but gets a light rainfall, whereas, the soil of the southern portion including Nagpur is lighter but receives a heavier rainfall. Much of the rain is chiefly concentrated in the months from June to October. From the end of October to the following June, with the exception of a few reiterate showers, it is practically dry.

The average figures of rainfall for Nagpur and Akola are as follows:—

Month	Nagpur Inches	Akola. Inches.
January	0.58	0.45
February	0.42	0.18
March	0.57	0.43
April	0 46	0.16
May	0.68	0.31
June	8.44	5.12
July	13.49	8.74
August	9.79	6.48
September	8.11	6.24
October	2.14	2.14
November	0 51	0.44
December	0.43	0.58
	45.62	31.27

Thus the average total rainfall in this tract is 45 inches in Nagpur, and 30 inches in Akola but it is exceedingly variable and far more so than is usual in areas in America growing cotton of similar staple. In Texas, for example, the average rainfall in the growing months is as follows;—

Month	Rainfall in inches.
April	3. 0
May	3. 7
June	3. 1
July	3. 0
August...	2. 1
September	2. 0

A comparison of the above two tables will show how great is the variability of rainfall from month to month in the growing season and specially so in the case of Nagpnr, and also how much more is the variation in the total rainfall of this tract than it is in Texas. This variability is illustrated by the following table showing the frequency with which certain ranges of total annual rainfall have occurred in the last 9 (Akola) or 12 (Nagpur) years respectively:—

Range of total rainfall	Number of occurences	
	Akola	Nagpur
Under 15 inches	1	0
15 to 20 "	2	0
20 to 25 "	1	0
25 to 30 "	1	0
30 to 35 "	3	0
35 to 40 "	0	3
40 to 45 "	0	3
45 to 50 "	1	2
50 to 55 "	0	3
55 to 60 "	0	1
Total	9	12

In Akola, the usual amount of rainfall is between 30 and 35 inches, with great likelihood of its being under 30 inches than over 35 inches; in Nagpur, there is almost an equal probability of the rainfall being between 35 and 50 inches.

Treating this rainfall for each of the rainy months (June to September) the frequency of various amount of rain is shown in the following table:—

Range of monthly rainfall.	Number of occurrences.							
	AKOLA				NAGPUR			
	June	July	Aug	Sept	June	July	Aug.	Sept
Under 4 inches	4	3	7	6	1	0	0	4
4 to 6 "	3	3	2	1	2	1	1	2
6 to 8 "	1	0	0	1	1	1	3	1
8 to 10 "	0	1	0	1	2	1	1	3
10 to 12 "	1	1	0	0	3	4	5	1
12 to 14 "	0	1	0	0	1	2	0	0
14 to 16 "	0	0	0	0	2	2	1	0
16 to 18 "	0	0	0	0	0	0	1	0
18 to 20 "	0	0	0	0	0	0	0	0
20 to 22 "	0	0	0	0	0	1	0	1

The most frequent rainfall in Akola is therefore, below 4" in June, between 4 to 6" in July and below 4" in August and September. At Nagpur, on the other hand, the rainfall is between 10 to 12 inches in June, July and August and below 4 inches in September.

With the above information, it is easy to establish a correlation between the total rainfall and the ginning percentage of cotton in the Central Provinces. The yield on the contrary is anti-correlated with the total rainfall. The following is the table showing the rainfall, the yield of Kapas and the ginning percentage at Nagpur:–

Year	Total rainfall in inches.	Yield in lbs.	Ginning percentage	Remarks.
1908	50. 53	191	35. 07	From 26th to 30th June 11. 39 inches rainfall.
1909	47. 58	229	32. 75	
1910	54. 21	88	34. 09	September rains and cloudy weather.
1911	39. 63	331	33. 83	
1912	36. 23	340	32. 35	
1913	44. 27	315	39. 04	
1914	40. 27	198	39. 89	
1915	44. 69	290	40. 00	
1916	58. 02	179	40. 22	Rains in September and November.
1917	51. 42	30	40. 00	Rains from September to October.
1918	35. 18	225	40. 00	
1919	48. 8	115	40. 00	

From the above it will be seen that the highest yield was got in the year of comparitively low rainfall and the lowest yield was got invariably in the year of high rainfall; the ginning percentage at the same time has a tendency to increase with the increasing rainfall. But it is difficult to establish a correlation between high yield and low ginning percentage for in 1912 when the yield was the highest i. e. 340 lbs., the ginning percentage was 32. 35, and in 1909 when the yield was low 229 lbs. the ginning percentage was also only 32. 75.

Temperature in the Central Provinces & Berar cotton area:—

The following tables show for each month (1) the average maximum temperature, (2) the average minimum temperature, and (3) the absolute maximum temperature, at Akola and Nagpur:—

AKOLA.

Month.	Average maximum temperature.	Average minimum temperature.	Absolute maximum temperature.
January	85. 2	53. 4	95. 9
February	90. 7	57. 5	101. 0
March	99 2	66. 0	111. 6
April	106. 0	74. 8	114. 5
May	107. 7	81. 1	116. 4
June	98. 2	77. 7	113. 7
July	89 0	74. 3	109. 0
August	87. 2	73. 3	99. 8
September	89. 1	72. 7	104. 2
October	91. 3	66. 2	104. 2
November	87. 0	57. 4	97. 5
December	83. 6	51. 4	97. 4

NAGPUR.

January	83. 5	55. 6	95. 1
February	89. 3	60. 0	102. 1
March	98. 3	67. 8	112. 8
April	105. 5	76. 2	114. 9
May	109. 3	81. 9	117. 7
June	98 3	78. 5	117. 3
July	87. 8	75. 1	105. 1
August	87. 0	74. 6	100. 1
September	89. 3	73. 8	102. 1
October	90. 1	68. 4	101. 1
November	85. 0	60. 3	96. 1
December	81. 3	54. 3	92. 1

The cotton is generally sown in June and the crop is reaped from November to January. The period of most rapid development of the plant is in September, after the rains are practically over and when all chances of water-logging of the soil have ceased. After

September, the rate of growth diminishes as the temperature falls. The temperatures should be high both day and night, for the best growth. Cool nights with warm days cause premature ripening, but after the plant has completed its vegetative growth, cool nights are favourable for maturing the bolls and ripening the seed. This is one of the reasons, why the longer and finer stapled cotton cannot be grown in this tract successfully, as the bolls mostly ripen late. No frost is likely to occur in this tract as the lowest temperature does not go below 50° F.

The mean temperature during the growing period is considerably higher than that in other countries producing cotton of the same staple or even better staple than that obtained from the Central Provinces and Berar.

The following figures may prove interesting in this connection:—

	Mean temperature.	
	April to August	September to Novr.
	°F.	°F.
America		
Mississippi ...	76	66
Texas ...	76	71
Georgia ...	69	62
Egypt		
Cairo ...	76	71
C. P.		
Nagpur ...	87	77
Akola ...	86	77

Humidity.

The effect of humidity on the quality of staple cannot be ignored. It has been found in the United States of America that humidity is a prominent factor in the production of fine staple cotton and the fact was illustrated with an example of the Sea Island Cotton. In fact, this

statement is more or less applicable to India as well. The best of the cotton tracts of India producing finer staples are under the influence of a humid atmosphere. Even the Punjab though far interior, cannot be an exception, being traversed by numerous perennial water systems. Now let us compare the humidity of the Central Provinces and Berar with that of other cotton growing countries. Dividing growing periods into two parts we have as follows:—

	HUMIDITY	
	April to August	September to Novr.
America	Percent	Percent
Mississippi	83	82
Texas	82	80
Georgia	79	84
Egypt		
Cairo	52	64
C. P.		
Akola	73*	56 @
Nagpur	76*	57 @

These represent in each case, in the first column, the growing period of the plant and in the second column, the flowering and bollforming period. The periods taken in the case of Akola and Nagpur are slightly different because the periods of growth are not quite the same. They are more or less corresponding to the humidity of the growing periods of the American cotton States, but the figures are much higher than in Egypt. The flowering and bollforming period in this tract is, however, very much drier than in America and distinctly so even than in Egypt. This is the most

* June to September.
@ October to December.

inportant fact which illustrates the inability of the Central Provinces and Berar to grow finer stapled cotton.

Month	Humidity	
	at Nagpur	at Akola
	Percent	Percent
June	59. 2	57. 6
July	81. 8	76. 8
August	82. 9	79. 7
September	78. 8	77. 1
October	61. 3	60. 7
November	56. 6	54. 4
December	54. 3	52. 4

Closely connected with this is the cloudy weather during the flowering season which has a remarkable influence on the setting of the flowers. A cloudy weather at this stage of the plant may turn into a poor crop what may otherwise be a most promising one.

Effect of manure on the Ginning Percentage and the length of staple.

There is very little published account on this subject. Even in Indian publications, there is very little reference pertaining to this problem. However, the effects of manures were tried for a series of years on the College Farm, Nagpur, chiefly with regards to the yield and relative profitableness of different manures. Similar experiment was also tried on the Akola Farm, but unfortunately the yield was noted as kapas and not in lint and seed separately excepting a few years.

The following table gives the average figures for three years from 1916 to 1919 showing the effect of different artificial manures on the yield and ginning percentage of cotton:—

Sodium nitrate	...	20 lbs nitrogen per acre.
Super phosphate	...	50 lbs. Phosphoric acid per acre
Sulphate of potash	...	35 lbs. Potash per acre.

	Kapas.	Lint.	Seed.	Ginning percentage.
	lbs.	lbs,	lbs.	
Nitrate, Phosphate and Potash.	397	159	238	40. 5
Nitrate and Phosphate.	370	148	222	40 0
Nitrate and Potash.	368	146	222	39 6
Nitrate.	300	123	185	39 9
Potash and Phosphate	206	82	124	39.8
Sulphate of Ammonia 20 lbs. nitrogen.	333	133	200	39. 9
Phosphate.	189	70	119	37. 0
Unmanured.	144	58	86	40. 2

A study of the above figures indicates, taking the ginning percentage of the un-manured plot as the standard, that all the three elements, nitrogen, phosphoric acid and potash are essential to raise above, or, more or less to maintain the normal ginning percentage. But absence of any one element shows a clear decline in the ginning percentage, specially more so in the case of nitrogen. Deficiency of potash has a slight influence

The following figures are obtained from this years experiment. conducted in 1924 & 25. Two samples of cotton were taken (1) Rosea (Gossypium neglectum), and (2) Buri (Gossypium hirsutum) They were obtained from plots treated with different quantities of castor cakes:

Analysis of the Castor Cake:-

Nitrogen ...	4. 64	percent.
Phosphoric acid	2. 00	,,
Potash	2. 00	,,

Rosea	Kapas lbs.	Lint ozs.	Seed lb. ozs.	Ginning percentage
No manure	2	$12\frac{1}{4}$	1 $3\frac{3}{4}$	38.28
6 Mds. Castor cake	2	$11\frac{3}{4}$	1 $4\frac{1}{4}$	36.59
8 ,, ,, ,,	2	$11\frac{1}{2}$	1 $4\frac{1}{2}$	35.94
10 ,, ,, ,,	2	$11\frac{1}{4}$	1 $4\frac{3}{4}$	35.16
12 ,, ,, ,,	2	$11\frac{1}{4}$	1 $4\frac{3}{4}$	35.16
Superphosphate	2	$11\frac{1}{2}$	1 $4\frac{1}{2}$	35 94
B u r i				
No manure	2	$9\frac{1}{2}$	1 $6\frac{1}{2}$	29 69
6 Mds. Castor cake	2	$9\frac{1}{2}$	1 $6\frac{1}{2}$	29.69
8 ,, ,, ,,	2	$9\frac{1}{2}$	1 $6\frac{1}{2}$	29.99
10 ,, ,, ,,	2	$9\frac{1}{2}$	1 $6\frac{1}{2}$	29.69
12 ,, ,, ,,	2	$9\frac{1}{2}$	1 $6\frac{1}{2}$	29.69

It is evident from the above figures that manure has practically no influence on the ginning percentage in case of Buri (Gossypium hirsutum) but there is a remarkable influence on Roseum (Gssypium neglectum). The ginning percentage of Rosea without manure is 38. 28 and when treated with 10 Mds. castor cake, it falls to 35. 16. Treatment with superphosphate also shows a distinct decline and in this case it corresponds to 8 Mds castor cake. The application of 12 Mds. castor cake does not show any further decline in the ginning percentage. Therefore, manuring of cotton crop is not as simple as it appears at the first sight to be. A critical study must be made before using a manure with regard to its suitability to a particular cotton crop, for different species of cotton vary in their response to manuring.

Table showing yield per acre of Rosea and Buri with different dressings of castor cake:—

	Rosea			Buri		
	Kapas lbs.	Lint lbs.	Seed lbs.	Kapas lbs.	Lint lbs.	Seed lbs.
No manure	652	250	402	383	114	269
6Mds. Castor Cake 22. 3 lbs. Nitrogen 9. 6 lbs. Phosphoric acid. 9. 6 lbs. Potash	698	255	443	521	155	366
8. Mds. Castor Cake 29. 7 lbs. Nitrogen 12. 8 lbs, Phosphoric acid. 12. 8 lbs Potash	750	290	460	506	150	356
10 Mds. Castor cake 37. 1 lbs. Nitrogen 16. 0 lbs. Phosphoric acid. 16. 0 lbs. Potash	708	249	459	581	172	470
12Mds. Castor Cake 44. 5 lbs. Nitrogen 19. 2 lbs. Phosphoric acid. 19. 2 lbs Potash	738	260	478	659	196	463

It is evident from the above figures that Rosea does not respond so markedly to manuring with castor cake as does Buri. And since it is observed that there is very little variation between the proportion of lint to seed with increased application of manure, it is certainly most profitable to manure Buri with castor cake. On the other hand inspite of Rosea giving an increased yield, it may not be so profitable due to the increased weight in seeds and corresponding fall in the quantity of lint.

Length of Staple

Length of staple is the primary factor of importance in Indian cottons, for it is this quality which largely determines its market value, apart from its yield and ginning percentage.

Table showing the variability in the length of staple with different manures:-

ROSEA

No manure	6 Mds. Castor cake.	8 Mds. Castor cake.	10 Mds. Castor cake	12Mds castor	Super phosphate cake
Length in 8ths of inches					
6	7*	7*	7	6	6†
6	7*	6*	7	6†	6†
6	6	6	6	6†	7*
5	7*	6†	6	6	6†
5	6	7	6†	6†	7
Average $5^3/_5$	$6^2/$	$6^2/_5$	$6^1/_5$	$6^1/_5$	$6^2/_5$

BURI

8	8	7	8	7	
7	8	7	7	8	
8	8	8	8	8	
8	7	8	7	8	
Average $7\frac{3}{4}$	$7\frac{3}{4}$	$7\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{3}{4}$	

It is very difficult to arrive at any conclusion from the above figures, neither can we at any rate approximate the truth, but it can be said in the case of Roseum that there is a slight tendency towards increase and the higher limit of the length of staple is more or less maintained.

There is very little evidence of any work done in this direction, perhaps further work may lead to some tangible results. It has been proved, that there is a correlation between the fall in the ginning percentage and an increase in the length of staple but any influence of manures on these factors still remains undetermined.

* about 7/8 inches.

† Between 6/8 and 7/8 Inches.

THE RELATIVE EFFECTS OF NITRONGEN AND PHOSPHORIC MANURE ON JUAR

H. P. Singha, IV year)

No Manure	Super phosphate at 350 lbs per acre	Sulphate of ammonia at 100 lbs. per. acre.	Super phosphate at 350 lbs. per acre and sulphatf of ammonia At 100 lbs per acre.

Each plot 1/20th of

The application of manure is necessarv in order to make up the deficiencies of the soil and to meet the particular demands of crops to obtain heavier out-turns than those under ordinary circumstances. But large out-turns do not necessarily mean larger profit. The extra out-turn must more than balance the extra expenditure involved in the production.

The following experiment was conducted to learn if certain dressings of fertilizers will prove paying in case of the crop of Juar. An area of 1/5 of an acre was selected. This was sloping in two directions. The area was divided into 4 plots along the direction of the top of the greater slope. The plot that was at the top of the other slope was not manured so that there was no chance of the result of manuring being exaggerated in any way.

Cultivation

All the plots received similar cultivation As the experimnt was originally designed for cotton, the fields had been prepared for it by giving three bukherings on the 14th, 26th and 29th of June and cotton was sown on the 29th June on all of them, but as the plants were eaten up by goats, it was bukhered up and Saoner Juar was sown on the 20th of July. Weeding was done once only on the 3rd of August. Thinning was done on the 28th of August. Hoeing was done thrice on the 8th, 21st ana 28th of August.

Manuring

The first plot received, no manuring, the second received 350 lbs of superphosphate per acre, the third was treated with Ammonium Sulphate 1000 lbs. per acre and the fourth one received both superphosphate and Ammonium Sulphate at the rate of 350 lbs and 1000 lbs per acre. Superphosphate was applied before sowing on the 26th of June and Ammonium Sulphate at the time of sowing of cotton on the 29th of June.

Sowing was done with Argarab lengthwise. Equal number of lines in each plot and about the same number of plants in each line were maintained and the operations of weeding and interculture were carried on

simultaneously on all these plots. The crop was harvested on the 11th of December. The cobs were removed but the fodder was left on the field for drying. The weight of the fodder was taken on the 15th of January when it was carted to the farmshed.

YIELDS:—

Plot No	Manures applied	Yield of grain in each plot	Yield of kadbi in each plot in green condition	Yield of grain per acre	Yield of kadbi per acre	Extra yield of grain with no manure	Extra yield of kadbi with no manure	Cost of manure for the extra yield	Price of extra yield both grain and Kadbi	Loss
								Rs, As, P.	Rs, As P,	Rs As P,
1.	No Manure	16	460	320	9200					
2	Super phosphate	22	570	440	11400	120	2200	27—5—6	26—0—0	1—5—6
3.	Sulphate of Ammonia	19	475	380	9400	60	200	20—5—0	4—0—0	16—5—0
4.	Super & sulphate of ammonia	22	625	440	12500	120	3300	47-10—6	33—0—0	14—10—6

Ratio—juar 30 lbs per rupee: kadbi 100 lbs per rupee. Super -1/3 per lb ammn sluph. 3/3 per lb

Remarks The crop on the untreated plot was decidedly poorer than the crop on other plots. The plants were stunted, vegetative growth was poor and the leaves slightly yellowish. The heads were small and consequently the yield of fodder and grain was poor. The plants on the second plot were very healthy from the beginning and the growth of the plants was good and the superiority of this plot over the third was distinct but it was inferior only to the luxuriant vegetative growth of the fourth plot. The third plot was slightly superior to the first and the general appearance of the crop was fairly normal. The plants were neither sickly nor very healthy. The fourth plot which received both nitrogen and phosphoric acid appeared remarkably healthy from the beginning. The plants were growing luxuriantly. The heads were big. The outturn of both grain and fodder was heavy.

It appears from the above results that the application of superphosphate or Ammonium Sulphate in the above doses results in heavier out-turn but in no case the extra outturn balances the cost involved therein. It will also be noticed that in the above experiment the plot manured with Superphosphate gave a higher yield than that manured with Ammonium Sulphate. Hence on this Farm Phsphoric Acid seems to be a more important factor than Nitrogen.

"TRANSPLANTATION DOES PAY"

(*B. S. Rao I. Ag. (Hon) Lecturer, Agricultural College, Nagpur*).

In a recent issue of the "Scientific Indian Agriculturist," an attempt has been made to show that in the raising of certain vegetable crops like cabbage, cauliflower and the like it is unnecessary to raise the seedlings first in a nursery and then transplant them in the field.

The writer of the article seems to be under the impression that the operation of transplantations which is generally resorted to is to prune the roots with the object of invigorating the shoot's growth. No doubt pruning of some of the tender roots does take place when the seedlings are lifted. But this is merely an unavoidable consequence and not the object in view. It is fully recognized by all gardeners that great care should be taken while lifting the tender plants from the nursery bed so that the injury to the roots may be reduced to the minimum, and that is why gardners water the nursery liberally at least a few hours before lifting the seedlings so that the soil particles may come away with the roots instead of the roots being torn awayand remaining in the soil.

The supposed " root pruning " is really not necessary for the proper growth of a cabbage or a cauliflower plant, because I cannot recall to my mind any instance in which root pruning accelerates leafy growth of a young plant. On the contrary, it is seen that in all cases of transplantation some of the tender roots are mutilated as a result of which some seedlings die altogether after transplantation while in those that survive, the growth is retarded. Hence transplantation delays the maturity of the plants. Plants transplanted only once, come into maturity at least a fortnight earlier than those transplanted twice.

It is quite possible to grow healthy cabbage cauliflower plants by sowing the seeds directly on the field provided the following conditions are satisfactory:—

(1) A thoroughly pulverised seed bed.
(2) Timely preparation of the land.
(3) Plenty of manure supply.
(4) Copious supply of water.
(5) Cheap means of protecting the young plants from scorching sun and heavy showers of rains.
& (6) Cheap and effective means of getting rid of insect pests during the early stages of the plant.

It may be possible to provide all the above mentioned conditions fully to plants which occupy a total area which is smaller than an average gardener's nursery bed. But for people who grow not for pleasure but for profit, these are obstacles which they really find difficult to surmount.

Firstly, market gardners have to grow a number of crops in a year to make their business profitable. Hence it is better for them to keep the cabbage and cauliflower plants growing on a small area of highly manured land before the rainy weather crops are completely removed from the field and sufficient cultivation given for the planting of winter vegetables.

Secondly, as the seeds of the above mentioned crusiferous plants require a very well prepared land for proper germination and rapid growth, it is not possible to achieve this condition on a large area in a short time In order to secure an even stand of the crop it becomes necessary to prepare entirely by hand labour small pits 2 to 3 ft. apart and drop 3 or 4 seeds in each pit and leave one healthy plant to grow and remove the rest. This means a large waste of seeds, which cost Rs. 3 to 5 per ounce.

Thirdly, for proper germination and growth during the younger stages, moisture has to be constantly supplied. On a large scale this is not only difficult but also causes a lot of waste of water.

Fourthly, when it is time to sow the seeds the rains will not have completely stopped. If after sowing the seeds unfortunately for the farmer and his seeds, there be a heavy shower, either the seeds are washed away or they get burried very deep or if the seeds have already germinated the young plants will be mutilated or detached from the land. Cabbage and cauliflower seedlings are particularly to be protected from erosion as these seedlings have a very feeble anchorage on the land. The shoot before it grows vertical bends twice at right angles, causing the weight of the plant to fall on one side. If a shower should cause the above mentioned trouble resowing becomes necessary which means waste of time and money.

Fifthly, seeds of cauliflower plants require protection from severe sun for at least 8 or 10 days. On a field scale it becomes very costly to command this portion

Lastly, these crops are badly damaged by various insect pests in the young stage. Operations like hand picking, spraying, submersion of the plants under water and the like are easily done if the plants are in an nursery.

It is a general practice among vegetable growers to remove from a nursery the best seedlings for transplantation and allow a few of those which could not develop properly due to crowding and competition to re-

main on the nursery itself. These undisturbed plants after earthing and irrigation soon recover and attain the same perfection as the transplanted ones. This indicates that root pruning actually retards the growth of the transplanted plants instead of accelerating it But this does not prove that transplantation is not necessary and can be left out in actual practice. Because the plants left undisturbed on a small, carefully prepared and well cared for nursery are not in the same category as plants got from sowing seed on a hastily prepared field and exposed to the adverse conditions mentioned above.

Therefore, it would be disastrous to sow seeds of cabbage and cauliflower directly on the field in face of above-mentioned difficulties apart from the " root pruning " theory.

Although " root pruning " does not pay "tranplantation does pay."

Melon Culture in River beds.

(*R. A. Ramayya, III year*)

Melon is commonly cultivated in the sandy beds of rivers which dry up after the finish of the monsoons. The rivers do not dry up completely but only partially leaving some water courses here and there. Melon culture is a fisherman's secondary occupation. Rectangular seed beds are made in the sands just by the side of the water course. The beds are made to the level of the water surface so that moisture may be supplied through seepage. Seeds are broadcasted in the seed-bed during the first week of January. These seed beds constitute the nursery which supply the seedlings for future plantation. The seeds germinate within 4 to 6 days and are ready for transplantation after 10 days.

In the river sands, trenches are dug-the distance from the centre of one trench to another being 5 ft. The width of the trench is 3 ft. at the top and 2 ft. at the bottom; depth being 1½ to 2 ft. varying with the water level in the river channels nearby. The trenches are dug by means of an implement called the *Khurpa*. The trenches are dug by six people forming two groups of three each. The first group of three works by means of the *Khurpa*, which has its blade 2 ft. long and 1½ " broad. It is fixed to a wooden frame with a handle attached to it which is 5 ft. long. The two ends of the rope are fixed to either side of the wooden frame and the other ends are tied to a straight piece of bamboo which is held by two people on either ends. The pressure is applied by the man who pushes the blade by means

of the handle and the two people on the other side drag it carrying the dug out sand to the upper surface. Thus, the first group of people make the trench to a certain depth and the next group of people deepen the trench following the same process by using a Khurpa which has its blade 3" broad.

Thus after the trenches are made, the next operation is the transplantation i. e. removing the seedlings from the nursery and planting them in trenches. The seedlings are planted at a distance of 2 ft. from plant to plant in the centre of the trenches. After the seedlings are transplanted, farm yard manure mixed with earth is put round each seedling giving 2 to 3 handfuls for each plant. The plants begin to grow by means of the moisture supplied by the seepage and the plant food is supplied by the manure. As they proceed with their growth, the sand heap are gradualy put into the trenches. After 15 days of transplantation, a second dose of manure preferably fish manure is given as top-dressing round the plants. By the time the plant grows to a height and begins to creep fairly well, the sands are also filled in the trenches and the whole bed, from one end to the other is made perfectly level.

The plant bears fruit within 2 months of its planting and is ready for marketing. The fishermen who are generally the cultivators get fruits till the out-burst of the first showers of the monsoon, by varying the time of transplantation of seedlings. The readiness of the fruits is indicated by the ashy turn of the leaves and the fruit at the junction of the stalk turning golden yellow in colour. Each plant bears an average 3 to 4 fruits.

The fishermen pay a rent of one rupee for every four trenches they make. A trench has about a 100 plants. Thus the rent for 400 plants comes to one rupee and taking 3 fruits as a sure average per plant, they fetch him 12 fruits. Thus, he would get from one acre of land 17,400 fruits. A fruit sells according to its size from -/3/ annas to -/8/- per fruit. Calculating each fruit to fetch 3 pies, his gross income would be Rs. 272. Making an allowance of Rs. 122 as expenditure over seed, manure, labour and the like Rs. 150, would be a clear net profit.

So, we find that Rs. 150 is a fairly good income for his side-way occupation like melon culture. In my opinion, the cost of cultivation can be lessened by the use of such shovels which are used in the railways and mines for digging out the coal. This would require less number of men to work at as compared with the method in practice which requires six men to work at. Besides, the quality can be improved and the number of fruits can be increased by the application of such material which would supply potash without being washed out by the seepage water. Such recommendations as these are worth the trial in order to improve melon culture in such places where river is nature's boon.

OUR SINDEWAHI TOUR

(*R. B. Ekbote IIyear.*)

Last month, we visited Sindewahi Seed and Demonstration farm for practice and training in Sugar cane cultivation and Gur manufacture. We left Nagpur precisely at 9–30 a. m. on 23rd January. The train began its run at a moderate speed. The city bustle cooled down and the tall towers of stately buildings and chimneys of the mills gradually disappeared from our sight. The landscape for some distance was sumptuous while after a few score furlongs luxuriant vegetation and grassy lands were seen. In some places the rabi crops were seen in their full bloom. The whole day passed away uneventfully. At last the Sun came down on the horizen. The western sky blushed into golden hue and after a while darkness seemed to steal through the fading rays. After about 8½ hours run the train reached its destination and we proceeded to the farm.

The farm is located in a solitary place about 2 miles from Sindewahi village where the population is sparce. The tract is mostly under forest except round about villages and hamlets where the land is under plough. The farm was started as an experimental station for sugar cane work. But lately it has been changed into Seed and Demonstration farm. The area of the farm is 89 acres, of which about 40 acres is under sugar cane.

Early the next morning we proceeded to work. We were shown the different crushing mills and the varieties of cane grown on the farm. Of the selected varieties from Coimbatoor Co 219, Co 226 are being tried. We then conducted trials to find out the percentage of extraction of juice from each mill and the capacity of crushing cane per hour in each case. The results obtained are tabulated below:—

Mill·	Variety	o/o of Juice.	Capacity per hour.
Power Crusher.	Khari	61. 5	930 lbs.
,, ,,	Dhaur	73· 0	1350 lbs.
Sultan Nahan.	Khari	63. 0	246 lbs
,, ,,	Dhaur	68, 5	235 lbs
,, ,,	Pounda	68. 0	330 lbs
,, ,,	Co 226	66. 0	272 lbs
Kirloskar Nahan,	Khari	64, 0	277 lbs
	Pounda	72, 0	150 lbs
	Dhaur	64. 0	280 Lbs

In the afternoon, we resumed our work. We started boiling of juice over Mc. Glashan furnace. One of the requisits for Gur manufacture is the boiling of juice to the required point, in the shortest space of time and at the economical fuel requirements. Several inventions were made to fulfill this aim. With the introduction of Mc. Glashan furnace more economy is effected not only in the fuel but also in manuring land by the ashes of the megass burnt. Moreover the boiling of juice is done in a comparitively less time than in the case of Poona furnace. We then carried out an experiment to find out the quantity of juice and megass required for 100 lbs of Gur. The result is as follows:- -

Juice	Megass reguired.	Time	Gur.
640 Lbs-	320 lbs	3 H.min 10	112 lbs-

The figures show that for 100 lbs of Gur nearly 571 lbs. of juice 285 lbs of megass as fuel are reqnired.

The next morning we went for harvesting, stripping and planting sugar cane. We practised all the methods of planting cane viz. Java Mauritious, New Poona and local methods. First we prepared Kayari beds and after cutting sugar canes into sets, planted them in the furrows after irrigating the beds. We returned at 12 0' clock and then went for swimming in the Gumoshi Tank near the farm. The tiny ripples on the limpid water were gently kissing the bank. After our return we enjoyed a delicious dish. In the after-noon we went round the farm with our Principal and learnt the history and economic aspects of the farm. We were also explained every important detail concerning the crops viz. Chillies, Chanda cotton, ratooning Khari Sugar cane growing on the farm.

In the evening we had candle race and other interesting events. After meals, we were entertained by our principal Mr. Allan and Mrs. Allan at the sugar cane juice party. Mrs. Allan distributed prizes to the winners of various events. This was followed by a singing programme and some funny imitations both well run by our student friends. Tuesday morning, we visited cattle breeding farm and went to see the manufacture of Gur by local method. In the noon we were on our move. We left Sindewahi by 1. 30 P. M. and arrived Nagpur at 9-30 P. M. The temporary pleasures of our tour thus came to an end for,

The pleasures are like poppies spread
Yon seize the flower, its bloom is shed;
Or like the snow falls in the river,
A moment white-then melts for ever.

College Notes.

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(*R. A. Rammyya and N. K. Pillai. Secretaries.*)

Social Gathering

The College was full of life and activity during the four days of this year's Social Gathering, viz. 19th, 20th, 21th, and 22nd. On the morning of the 19th old boys were received in the College Hostel. This year we were lucky in having amidst us a number of old boys. After the morning tea the students hurried to the College Gymkhana grounds to witness a hockey match between the present and the past students. The present students played the past students in a foot-ball match which ended in a draw. " Oospar " a Social Drama in Hindi was staged in the night. 100 Yards, 440 Yards, Long Jump, High Jump, Shot put, Bullock race and one mile race were the chief events that were competed on the 21st. The most thrilling event was the tug of war between the present students and the Staff.

Selected pieces staged in the night were:—(1) Pyramus and Thisby from Midsummar Nights' dream The Artizan play. (2) Godshill robbery from Henry IV, (3) State Secrets, a modern play. The play was a complete success and was much appreciated by the gentry who attended the Performance. The students and the Staff were photographed in the morning and elocution competetion was the next item in the Social Gathering Programme.

In the evening Hon., Mr. Martin the Finance member to the Government of C. P. delivered a short but eloquent address and distributed prizes to the winners.

With the " At Home " the social Gathering come to a termination.

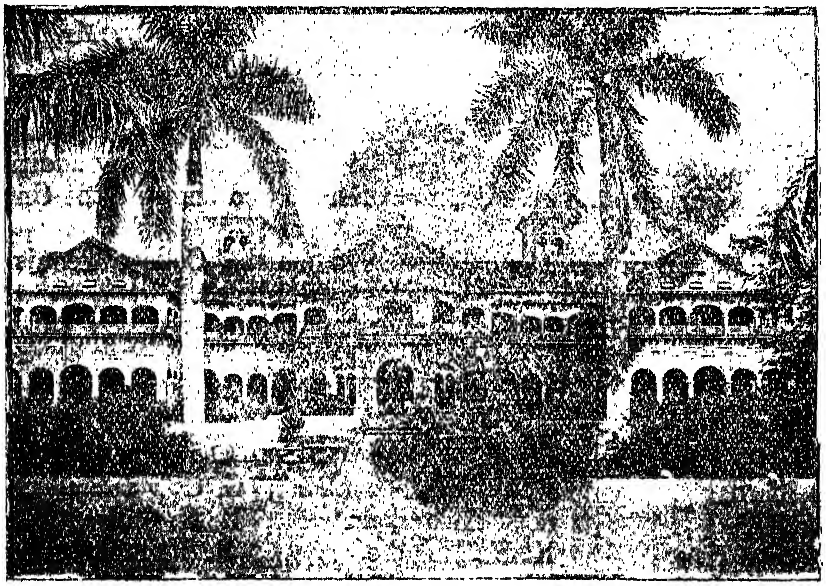
The Agricultural Association

The inaugural meeting of the Agricultural Association during the current Academic year was held on the 11th August 1925 under the presidency of Mr. Ram Narayan Kayasth M. Sc., B. Ag., when R. G. Allan Esqr. M. A., L. Ag., our Principal delivered a very interesting and instructive lecture on " Earth Movements and volcanicity, " illustrated by lantern slides. He gave us a clear idea of the formation of volcanoes and their geolgical significance.

The Second meeting was held on the 5th September when Mr. R. A. Ramayya of the III year read an interesting paper on "The importance

of Agricultural Education in India." He pointed out the defects of the present system of College Education and suggested improvements.

Before the third meeting of the Association, a paper on "Nitrogen Fixation and Soil Bacteria" was read by Mr. Kalamkar of the First year degree class. It was illustrated by lantern slides.



The Agricultural College Nagpur.

The Fourth meeting which was held on the 21st November was also presided over by our Principal. The last paper during the session was read by Mr. R. B. Ekbote of the Second year on "Cotton Cultivations.' He exhaustively dealt with the various problems which the importance of the crop calls forth at present day. It is hoped to hold a few more meetings before the year is out.

We are extremely grateful to Mr. S. B· Gokhale B. A., LL. B. who has patronized our Association by his generous award of some prizes for the best essay read in the Association.

The sports section. Abnormal as the rainy season was this year ,the sports were badly interfered with. Although a few matches were played, very little practice was possible on the field,—slippery and smooth as it continued to be through out.

Cricket—The conditions under which we play the game are not very satisfactory, yet it is pleasing to note that a great keenness is displayed by the boys. We had a happy session and won most of the matches. The most interesting fixture was that between the staff and the students.

Foot-ball—The Football team is ably captained by Mr. Datta and acquitted itself fairly well in most of the matches.

Hockey and Tennis—Mr: Cleophus a good back, and M. N. Shrivastav and Bakre a set of brilliant forwards are happy additions to our Hockey team ,although we did not offer a good show in the University tournaments.

An unusual interest was displayed on the College Tennis Courts this year and several interesting matches were played.

We give below a list of prize winners in various events in the College sports of 1925.

THE PRIZE WINNERS OF 1925,

1. 100 yards flat-race.	N. K. Ghosh (First)	Aliyarkhan (2nd)
2. 440 Yards „	M. G. Wadegaonkar „	G. G. Phadke „
3. Sack Race.	R. J. Kalamkar „	R. N. Gadre. „
4. One mile race.	K. N. Phadke. „	R. N. Kher „
5. Bullock Race.	S. K. Waishampayan „	
6. Hurdle Race.	A. S. Bakre.	R. J. Kalamkar. „
7. Three legged race.	M. G. Wadegaonkar and Borgaonkar	R. A. Ramayya and A. R. Vaidya.
8. High Jump.	A. S. Bakre.	W. R. Sathe.
9. Long Jump.	M. G. Wadegaonkar.	R. J. Kalamkar.
10. Short put.	S. K. Waishampayan.	R. J. Kalamkar.
11. Ping pong	R. A. Ramayya.	D. V. Subbarao.
12. Chess.	N. K. Pillai.	N. K. Das.
13. Double—bar.	G.L. Talwelkar.	Hira Lal Vaishya. and Borgaonkar
14. Mrs. Allan's Singles Tennis Champion-ship Medal.	R. A. Ramayya.	
15. Kartar Singh's all round athletes Medal.	A. S. Bakre,	

NEWS AND HINTS

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The New Viceroy

The Rt: Hon: Edward Frederick Lindley Wood, Lord lrwin is the only surviving son of Viscount Halifax. Educated at Eton and Oxford, the new Viceroy married the daughter of the Earl of Onslow, a former Minister of Agriculture and now has a family of three sons and a daughter.

Lord lrwin typifies in him all that is best in English life. He is a man whose life and doctrine are in complete harmony with a very lofty moral principle. He is a scholar of real distinction yet his sympathies with ignorant and half educated mankind are both generous and affectionate. There are few men who are more greatly loved and trusted by the people among whom they live than Lord lrwin. He longs for a better world and prays for it. The unhappiness of the poor, the divisions and separations of social and political sectarianism distress him and pain him but never deject him. He holds firmly to his faith that love and good sense can deliver man from all the delusions of materialism and that a day will come when an England conscious of comradeship and a British Empire conscious of unity will lead the world into the way of peace.

In Lord Irwin—a man of such character and a broad outlook the ryots of India will have their best friend. Besides the prestige due to his official experience as Minister of Agriculture in Britain, he will bring to his task in India an intimate and practical acquitance of the problems of the land. It is not Agriculture alone which is Lord Irwin's special subject, he is deeply interested in education, a tradition which he has inherited from his grand father who as Secretary of State for India penned that memorable despatch of 1854. Not only that, the young viceroy, for he is only 44 years of age, is intersted in every branch of nation building activity.

Locarno Pact:—

December lst 1925 is an important date in the history of the world. The plenipotentiaries of the various states of Europe affixed their seals in London to the memorable document known as the Locarno Treaty which may usher in an era of peace and world prosperity. We summarise below,

How Locarno binds Britain to Europe.

1. If any Europeon power becomes an aggressor and resorts to war all the rest will go to the help of the one attacked.
2. Britain to assist Germany if she is attacked by France.

3. Belgium frontier to be inviolate.
4. Britain to assist France if she is attacked by Germany.
5. Rhineland zone to be neutral and to be demilitarised.
6. Arbitration treaty for settlement of disputes between Germany and Poland, Czecho-slovakia and Germany, guaranteed by France.
7. Czecho-slovakia and Russia to assit each other and be helped by the other powers if any party to the pact attacks them.
8. Italy to assist the defence of Czecho-Slovakia and Poland if they are attacked.
9. Italy to assist France if she is attackd by Germany.

Cultivation of Onions,

After germination, the onion seedlings are transplanted into boxes or thumb pots. The later are the best media for the nursery bed-stage because the seedlings may be planted without experiencing a check in their removal. The actual time for planting varies. In about three months time, the onion seedlings get hardened off thoroughly. If the crop is to be a success, the plant should be set in soil which has been thoroughly worked to the depth of two spits during the winter. As the work on the farm proceeds, Farm yard manure at the rate of one ton per one hundred sq. yds. should be incorporated.

Firm soils need only light pressure and light soils require considerable pressure to give them the proper texture. Onions should have one foot of space for proper developement and when planting it is advisable to bury the bulb to about half its depth. After planting the cultivator may rest on his oars until the critical time for feeding arrives. Feeding too early results in thicknecks and feeding too late causes the bulbs to split.

The period during which the crop receives special feeding covers 6 weeks and is divided into 3 stages of a fortnight each. During the first fortnight the formation of roots is encouraged by four applications of super phosphate 30°/₀ at the rate of 1 ounce per plant. During the second fortnight each plant receives four applications of nitrate of soda at the rate of half an ounce, for the purpose of stimulating leaf-developement. During the third fortnight the plants are ready for storing material in the bulbs which process is assisted by four dressings of sulphate of Potash each plant receiving half an ounce. When the crop shows signs of riping, nature should be assisted by bending the stump over about four inches above the bulb. In about six months' time the crop should be lifted the bulb refined thoroughly and stored in a dry place.

To immune the plant from the disastrous attack of the onian fly, application of parafine emulsion should be given in mild dozes.

Value of a Garden er's diary.

A diary gives us the first lessons in self reliance and impresses vividly upon our mind facts that would otherwise be neglected or overlooked. When correctly compiled, a gardener's diary may be made both useful and interesting. A diary is of the greatest assistance to those responsible for the maintenance of supplies of flowers, fruits and vegetables and the like. A diary is indispensible as a means of ascertaining the period occupied from the sowing of the seed to the maturing of the crop and in some instances notes of the duration of the useful seasons would be advantageous. The following hints in maintaining a diary may prove useful.

(i) A note should be made of the first appearance of the farm and garden pests or diseases. This will be useful in combating those troubles in future years. A knowledge of the time of attack enables the farmers to apply preventive measures at the right moment, thus very often obviating the developement of the disease.

(ii) A note of any outstanding feature in the weather would be interesting such as the effect of frost on certain out-door plants, fruits, trees and the like.

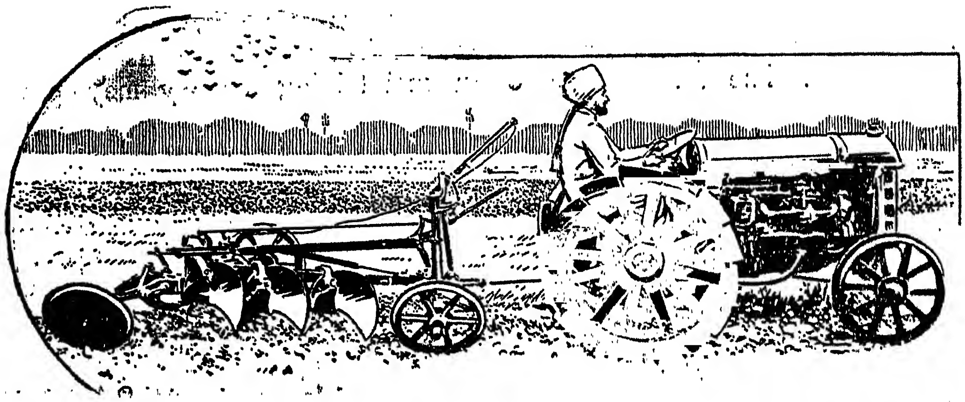
(iii) Notes on the items to be recorded during the course of the year should include the dates of all such operations as seed sowing, all forms of vegetative propagation, germination and flowering periods, many stages of potting, planting and transplanting, the thinning of vegetable and fruit crop, stopping and disbudding, all forms of prunning, application of manures and fertilizers.

THE ART OF AGRICULTURE.

AGRICULTURE is an art, and it is an art that was practised centuries before the sciences were born with which it has become associated in modern times. Nevertheless, the farmer of to-day working under modern conditions, cannot afford to neglect the teachings of science as they affect his own art; and that farmer will be the successful one who is able to understand what science has to tell him, and to utilise the weapons which she puts into his hands.

HENRY FORD.

HIS LIFE AND WORK.



The career of Mr. Henry Ford in engineering and in business has been nothing less than wonderful. His recently published book, " My Life and Work, " has therefore evoked universal interest.

Mr. Ford was born and brought up on a farm. There was too much hard hand labour on the farm during those times. Even when young, Mr. Ford suspected that much might somehow, be done in a better way. ' That is what took me into mechanics, ' he says.

He had a kind of workshop with odds and ends of metal for tools before he had anything else. It was, however in his 12th year that two big events happened. One was getting a watch and the other was meeting a road engine which happened to be the first vehicle other than horse drawn which he had ever seen. It was intended primarily for driving threshing machines and sawmills and was simply a portable engine and boiler mounted on wheels with a water tank and coal cart trailing behind. The engine had a chain that made a connection between the engine and the rear wheels of the wagonlike frame on which the boiler was mounted. The engine was placed over the boiler and one man standing on the platform behind the boiler shovelled coal, managed the throttle, and did the steering. Pleased with the interest that young Henry took in the engine, the engineer explained it thoroughly to him. The engine made two hundred revolutions a minute, and one peculiarity was that the chain pinion could be shifted to let the wagon stop while the engine was still running. This last is a feature which in different fashion, is incorporated into modern automobiles. " It was that engine that took me into automotive transportation. "

Mr. Ford tried to make models of this engine and actually made one. Four years later, he managed to get a chance to run one, and when his apprenticeship was over, he worked with a local representative of the Westinghouse Company of Schenectady as an expert in the setting up and repair of their road engines. By this time he was a full-fledged machinist. His most constant ambition was " to lift farm drudgery off flesh and blood and lay it on steel and motors." He therefore thought it more important to develop the tractor, but circumstances took him first into the actual manufacture of road cars. People seemed to be more interested in something that would travel on the road than in something that would do the work on the farms. And his work with the Westinghouse representative only served to confirm the opinion he had formed that steam was not suitable for light vehicles.

His First Motor car.

He got interested in the gas engine and followed its progress, and in 1885 repaired an Otto Engine at the Eagle Iron Work in Detroit. In 1887 he built one engine on the Otto four-cycle model, which was eventually destroyed. That was the beginning of his work with the internal combustion engine. He made a great many experimental engines out of tubing, until in 1890 he began on a double-cylinder engine. He worked hard on it and completed his motor car in 1892.

This first car had something of the appearance of a buggy. There were two cylinders with a two-and-a-half-inch bore and a six-inch stroke set side by side and over the rear axle. They developed about four horse power, which was transmitted from the motor to the countershaft by a belt and from the countershaft to the rear wheel by a chain. Mr. ford is a great business man. "I draw a plan," says Henry, "and work out every detail of the plan before starting to build. For otherwise one will waste a great deal of time in makeshifts as the work goes on and the finished article will not have coherence. It will not be rightly proportioned. Many inventors fail because they do not distinguished between planning and investigating "

Tractor Farming.

There have been a number of developments in production and business which have made Mr. Ford's name a household word throughout the globe The most recent development is the tractor in connection with power farming. Its possibilities were demonstrated during the war. In the Allies' war-time food emergency, " we sent in all five thousand tractors across the sea in the critical 1917-18 period when the submarines were busiest " This entire shipment went through within three months and that

is why the tractors were being used in England long before they were really known in the United States. The planning of the tractor did, in fact, precede the automobile. But then it was not continued until the automobile was fashioned. To evolve a tractor which would be light, strong and simple enough to be run by anybody besides being cheap enough, Mr. Ford worked for about fifteen years on a design and spent some millions of dollars in experiments. The hard problem was to get bearings that would stand up against the heavy pull. They fixed upon a four cylinder engine that is started by gasoline but runs thereafter on kerosene. In addition to its strictly pulling functions, the tractor to be of the greatest service, had also to be designed for work as a stationary engine so that when it was not out on the road or in the fields, it might be hitched up with a belt to run machinery. Thus the Fordson tractor, was evolved which brings down the cost of ploughing and saves about half a dollar per acre, compared with ploughing by horse.

One more venture of Mr. Ford may be mentioned. This was the Henry Ford Trade School incorporated in 1916 "to fulfill the boys' educational possibilities and at the same time begin their Industrial training along constructive lines." In this school, three cardinal principles are adhered to: first, that the boy was to be kept a boy and not changed into a premature working man; second that academic training was to go hand in hand with Industrial instruction; third, that the boy was to be given a sense of pride and responsibility in his work by being trained on articles which were to be used. The school is open to boys between the ages of twelve and eighteen and is organized on the basis of scholarships. The best instructors obtainable are on the staff and "the text book is the Ford plant" The school has a regular factory workshop with the finest equipment. The boys who have progressed farthest do fine micrometer work. When they graduate, places are always open for them in the shops at good wages. Beginning with six boys, the school now has two hundred and is possessed of so practical a system that it may expand to seven hundred.

It has been possible here to refer to only the principal achievements of Mr Ford. A perusal of his autobiography will prove both interesting and instructive.

Mr. Ford is one of the richest man of the world and commands an extensive business. He is now engaged in constructing the biggest aeroplane.

The view which I take is that it is far better to do something practical on a modest scale without delay, than to continue playing with visions of ambitious and resplendent polytechnics
—*Lord Ronaldshay*.

NAGPUR.

Agricultural College Magazine

Annual subscription Rupees three only.

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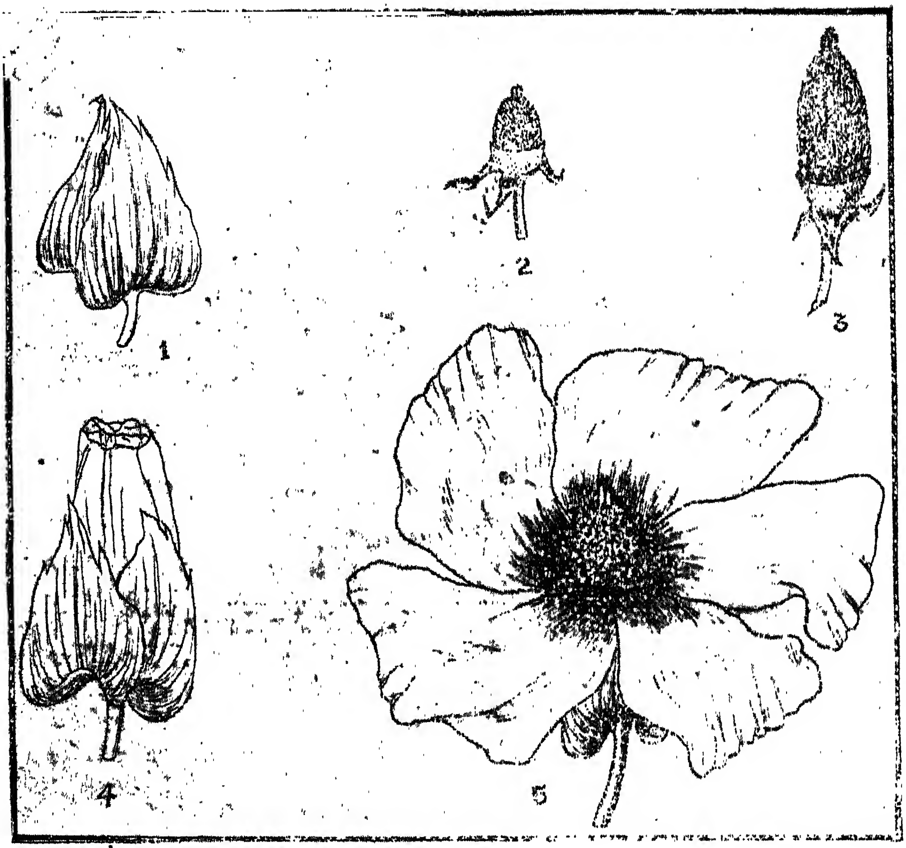

Plate I

Figure 1 Flower-bud enclosed within the bracteoles.
,, 2 ,, ,, after removal of bracteoles and petals.
,, 3 Staminal column and the protruding stigmas.
,, 4 Flower just opening.
,, 5 Fully opened and fertilized flower.

Agricultural College Magazine.

" Perfect agriculture is the true foundation of trade and industry; it is the foundation of riches of States. "

Vol. 1. *JULY 1926* *No. 2.*

Editorial Comments

The college

The Viceregal visit is a rare privilege. Our department was singled out for His Excellency's inspection and there is hardly a soul in Nagpur who has not heard of the University College of Agriculture in this connection. One of our friends gives in these pages an account of the pleasant time we passed with Lord Irwin. The readers will do well to remember His Excellency's significant advice to the students. 'Doing ordinary things in an extraordinary way is much better than doing extraordinary things in an ordinary way.'

* * * *

None who has turned the pages of 'Review of Agricultural operations in India, 1924-25' will fail to be impressed by the magnificient picture-block on the front page. Needless to say the Agricultural college building is an imposing and stately piece of architecture and we long for the day when the Science college is removed to its new premises and the whole edifice is placed at our disposal thus avoiding the present congestion and inconvenience.

* * * *

Our magazine is yet a tender seedling which must be reared delicately and nourished with the utmost care. It will therefore be sometime before we are in a position to include the vernacular contributions of the young enthusiasts within the covers of our magazine.

* * * *

As will be seen we have reserved in the magazine a section for ' old collegians ' and we trust the past students will keep us informed of ' their doings ' and provide us with the practical experience of theirs in their respective fields of work.

* * * *

On the 24th of March 1926 with Mr. Sawargaonkar in the chair we met to congratulate Mr. R. G. Allan on his being appointed as the Director of Agriculture of the province vice Mr. F. J. Plymen proceeded on leave. The cultivators and the members of the department expect great things at the hands of the present Director before he lays down the reins of office.

* * * *

The college reopened with Dr. H. E. Annett as our Principal. He has already endeared himself to the students who have in him an efficient professor, a kind and sympathetic chief.

The senior I. Ag. class is working on the lines of the university syllabus. Last years ' failures at the second year diploma are keeping terms with the senior I. Ag. students. Under such circumstances we hope the University will realise that it is not fair to deprive the last years' failures of the benefits accruing from the affiliation.

It is desired that the University sports committee this year will allow the whole college to participate in the University Tournament The two University classes can hardly represent the college as a whole. In trivial matters as these we hope small technicalities will not be allowed to mar the students' aspirations.

The Poona Agricultural Exhibition is coming off on the 20th October 1926. It is going to be an ' Ideal show '. A series of bulletins incorporating the daily progress is pouring forth. Will not the college arrange for a Poona tour which is bound to be fruitful of results ?

There is a total of 120 students as against 99 last year, on the college rolls. To our college has flocked this year the many tongued generation of youth from the very corners of the orbis terrarum, we heartily welcome the 'First years' to whom we would only say 'make yourself at home.'

The Weather

This year's rainy season is another instance of the vagaries of nature on which is dependent the business of farming. Till the first week of July an anxious time was passed. Six inches of rainfall during the middle of May raised false hopes that the monsoons would set in early. The expected showers never came, on the contrary in parts of Berar, some villages experienced shortage of water even for drinking purposes. By the beginning of July however, there was a continuous rainfall in various parts of the Province. This has greatly hampered the sowing operations of cotton and juar. Those who followed the advice of the experts of the department and had the dry sowing of cotton, have a decided advantage. The capricious nature of this year's rainfall will be a lesson to the cultivators that productive agriculture is possible only when certain amount of risk is undertaken.

Royal Commission

The announcement of the appointment of Royal Commission of Agriculture has created a great sensation in every quarter of the country. The work of the Commission centres round the solution of various confronting and intricate problems of Agriculture. The primary question is the poverty of the Indian farmer which so often impedes the introduction of improved methods of agriculture. The success of the commission will chiefly depend on its efforts in removing illiteracy of the masses. We anxiously await its final report and recommendations.

WHAT THE ENGLISH DEPARTMENT OF AGRICULTURE COSTS.

An officially contributed article in the "Year Book of the National Farmers' Union for 1926" shows the total cost of the Ministry of Agriculture for England and Wales to be £ 3,275,000 (in round figures). Of this sum £ 1,000,000 is devoted to subsidising the beet sugar industry, £ 875,000 is spent on the settlement of men (primarily ex-service men) on the land, £ 340,000 on Agricultural education, and £ 310,000 on Research. In addition, £ 475,000 is required for the general staff of the Ministry and its expenses, and £ 275,000 for miscellaneous items, none of which are very large, but all of which are of direct advantage to farmers.

A NOTE ON POLLINATION AND ITS ECONOMIC IMPORTANCE ON SOME OF THE CHIEF CROPS OF THE CENTRAL PROVINCES AND BERAR.

(*K. P. Shrivastava, Extra Assistant Director of Agriculture*)

" The methods of pollination and the possible occurrence of natural cross-fertilization in crops raised from seed are matters of the first importance both in the improvement, introduction and testing of varieties, and also in the growth and distribution of seed to cultivators in India". * In this paper the preliminary observations made on the chief varieties of cotton, bajra, wheat and gram will be described.

Cotton—In the Cenral provinces and Berar cotton now covers 17. 9 per cent of the total cropped area. It is grown mostly as an unirrigated crop; and the chief varieties found are those of Gossypium Neglectum, Indicum and G. Hirsutum. Of these, G. Hirsutun-Buri and Combodia occupy only a very small area. G. Indicum-Bani occurs partly as a constituent of the mixture in very small proportions along with G. Neglectum. Thus G. Neglectum and its varieties occupy practically all the cotton area of these Provinces. There are four chief varieties of G. Neglectum, viz G. Neglectum var. *Roseum*, G. Neglectum var. *Malvensis*, G. Neglectum var. *Verum* and G. Neglectum var. *Cutchica*. Of this G. Neglectum var. roseum was isolated by the Agricultural Department, Central Provinces, and is now grown as a pure strain on at least 700, 000 acres. The remaining large area of about 3763, 000 acres is occupied by a mixture mostly of the varieties of G. Neglectum in different proportions. In this mixed cotton, the short stapled varieties largely predominate with the result that the provincial outturn consists of cotton with an average length of 5/8 to 6/8 of an inch only. In order to effect the improvement in the quality and yield it is not only essential to grow improved strains but to maintain their purity.

Flowering—The seed is sown in the beginning of June immediately after the break of the monsoon. It has been noticed that if the sowing is late by only a week or ten days, there is a considerable effect on the growth of the

* Howard —Memoir ;Vol. III, No 6.

plants and on the production of buds, bolls, etc. The plants remain stunted all their lives and seldom regain their natural size and development. The number of buds and flowers produced on such plants are also reduced by nearly one half.

Under normal conditions the flower buds begin to make their first appearance when the plants are about 2 months old. The young bud takes about six weeks to develop fully. In the beginning the bud is completely enclosed by three large bracteoles and the growth is slow. The bracteoles open out after about three weeks, and the exposed bud then begins to grow more rapidly. It increases in size, and the twisted petals change from greenish to yellowish or whitish colour There is then a third period of development, when the bud rapidly expands and blossoms into the flower. This period is short and is of about 14 hours duration only.

An average plant, produces about 75 buds. A large number of these however, drop off after flowering. A few drop even after the bolls have formed. On an average only 30 per cent of the buds develop into full sized bolls which ripen and burst, and the rest drop off (see table I). Evidently this is a serious loss and requires careful investigation. The flowers in cotton generally open between 7 to 10 A. M., varying slightly according to the temperature and humidity of the day. In the case of G. Hirsutum the twisted petals begin to unfold early in the morning and the flower is fully open by 8 A. M. But in case of G. Neglectum var. *Roseum, verum and malvensis*, the unfolding of the petals begins an hour later, and the flowers open fully by about 10 A. M. They remain open and turgid till 12 in the noon and then begin to close and gradually become tinged red and droop. By about 11 P. M. the flowers fade away completely and the petals fall flaccid. The fading continues, and by 4 P.M. the next day they become shrivelled and fall off, leaving a young green ovary with dry remains of the stigma on it. (See Table No. II)

Pollination and Fertilization—In the young bud the monadelphous stamens are closely set round the pistil and the stigma is just at the top of the staminal column. Later on, the style grows rapidly and in the fully developed bud it becomes quite exserted from the staminal column. In the fully developed bud, which is just opening, the stigma is from 2 to 3 millimeter above the level of the anthers. (*See Plate I figs 1 ,2, 3, 4, 5*)

The stamens are indefinite and the anthers which are small, and kidney shaped, are borne on short filaments. The dehiscence of the anthers takes Place longitudinally. In majority of the flowers, they burst when the flowers are only half opened. But the anthers liberate the pollen only when the flowers are fully opened and exposed to the sun and air. It takes about an hour for the flower to open completely.

Fifty flowers from each of the various types were examined, and out of a total of 400 flowers, it was found that 342 flowers were self pollinated, the pollen in each case being found sticking in abundance on the stigma immediately after the flower opened. The period between the bursting of the anthers and shedding of the pollen is so short that in these flowers there remains little chance of cross fertilization. In the remaining 58 flowers, immediately after they opened there was no pollen on the surface of the stigma. The examination was done with the aid of a powerful lens, thus leaving no chance of the presence of the pollen grain being left unnoticed on the surface of the stigmas. The pollen grains are small, round, pale yellowish in colour, and escape detection if examined with the naked eye.

It will thus be seen that 85 percent of the flowers get self pollinated as soon as the flowers open. Further, it has been noticed that the insects begin to come about an hour after the flowers are fully opened. During this period, some more flowers get self-pollinated, the slightest jerk to the flowers being enough for the liberation of the pollen grains from the already burst anthers; and thus 2 to 5 per cent more of the flowers get self-pollinated.

The remaining 10 percent flowers, which are not self-pollinated are obviously the only flowers left in which chances for crossing taking place are very favourable.

The structure of the flower, and the presence of a number of insects in the fields when the cotton is flowering, indicates that natural crossing goes on normally in between many varieties. The brilliant colour of the petals, the prominent beautiful purple eye in the centre of the flower, and the occurrence of nectaries at the base of calyx clearly show that these flowers are constructed to attract insects for helping cross fertilization

During the flowering season, a large number of butterflies and bees visit the flowers. The following were most common throughout the season, and were captured while actually visiting the flowers:-(1) Papilio demoleus, (2) Catopsilia pyranthe, (3) Terias hecabe, (4) Junonia lemonias, (5) Apis dorsata, (6) Lithurgus atratus and (7) Xylocopa sp. † The pollen was found sticking the legs, abdomen and wings of all these insects.

Thus from the structure of the cotton flower and the regular visits of insects, it is evident that crossing must be taking place. That it does take place has been further confirmed by the fact that when pure line cultures of different varieties are grown side by side, a number of cases of natural crossing are always detected.

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† Identified by Mr. J. L. Khare.

Remarkable instances of natural crossing were found to occur between varieties of cottons having drab lint, and in those possessing white lint. A number of pure line cultures of different varieties of cottons were grown side by side, and the seeds from individual plants wers sown next season in lines, and it was found that many of them were heterozygous and were splitting. Amongst the Indian cotton, gossypium Negleclum var. Kokatia and G. obtusifolium var. Coconada have drab coloured cottons and these crossed with other varieties. The following table gives the figures obtained from a number of such plants indicating the Mendelian ratio of 3 : I :-

Variety.			No. of plants n line cultures	Plants with Drab coloured cotton.	Plants with white coloured cotton
G. Negletum.	sub, var.	Kathiavarensis.	85	63	22
,,	,,	Bengalensis	77	62	15
,,	,,	Burmanica.	54	39	15
G. obtusifolium	,,	Sindica.	112	82	30
G. herbaceum	,,	Sakalia.	92	67	25
		Total	420	313	107
		Calculated 3 : I		315	105

Conclusion–About 90 percent of the flowers are selfpollinated and the remaining 10 per cent are cross fertilised. This natural crossing goes on every year with the result that the cotton grown by the cultivator consists of a mixture of every variety, and of splitting types, the lint from which is necessarily very variable in length, strength and fineness.

As it is obviously desirable, both in the interest of the weaving industry, and of the cultivator that the poor quality cotton which at present forms the bulk of the cotton produced in this province, be replaced by superior strains, efforts should be made to grow and maintain pure varieties. But on account of the natural crossing occurring in different varieties when grown near each other, this object can safely be achieved by arranging for the exclusive cultivation of selected variety over particular areas.

(To be continued)

TABLE No. II.

A summary of the development of flowers, pollination etc in cotton .

Time of Observation	G. Neglectum. Roseum.	G. Neglectum. Verum.	G. Neglectum. Malvensis.	G. Indicum. Bani.	G. Hirsutum. Buri.	G. Hirsutum. Cawnpore American
6. 00 A. M.	Closed.	Closed.	Closed	Closed	Closed	Slightly opened at apex.
7. 30 A. M.	,,	,,	,,	,, ,,	Half opened. Anthers burst.	Half opened. Anthers burst.
8. 30 A. M.	Opening at apex.	Half opened.	Half opened.	Half opened.	Flowers opened. Pollinated.	Flowers opened. Pollinated.
10. 00 A. M.	Flowers opened. Anthers burst. Pollinated.	Flowers opened. Anthers burst. Pollinated.	Flowers opened. Anthers burst. Pollinated.	Flowers opened. Anthers burst. Pollinated	,,	,,
1. 30 P. M.	Petals Closing.	Petals Closing.	Petals Closing.	Petals Closing	Petals Closing.	Petals closing and tinged.
4. 00 P. M.	Petals half closed.	Petals half closed.	Petals half closed.	,, ,,	Petals half closed. turning pink.	Petals half closed. deep tinged.
6. 30 P. M.	,, ,, ,,	,, ,, ,,	,, ,, ,,	Petals half closed.	Pink, flaccid.	Closed pink. flaccid.
11. 00 P. M.	Closed.	Closed. Petals reddish and flaccid.	Petals reddish.	Almost closed, reddish, flaccid.	Closed pink, flaccid.	..
4. 00 A. M.	,,	,, ,,	Closed, red, flaccid.	Closed.	,,	
7. 00 A. M.	Faded. Petals pink	Faded.	Faded.	Faded.	Faded.	Closed. deep pink, faded.
10. 30 A. M.	,, ,, ,,	,,	,,	All faded.	,,	Faded.
2. 30 P. M.	,, ,, ,,	Shrivelled and dropped.	Fully faded	Shrivelled and dropped.	Shrivelled.	
4. 00 P. M.	Dropped.		Shrivelled. and dropped	.. .. ,,	Dropped.	Dropped.

TABLE 1.

Showing the number of buds produced and the percentage of bolls formed—Average of 15 plants.

Variety.	No. of buds formed	No. of bolls burst	Percentage of bolls formed
G, Neglectum—roseum	78	25	32. 0
G. Neglectum—Cutchica	72	22	30. 5
G. Neglectum—Vera	80	24	30. 0
G. Neglectum—Malvensis.	65	22	33. 8

Importance of Soil Maps For Agriculture.

The history of geological map making can be traced to the 18th century. An attempt was then made to produce general maps of separate countries which naturally could give no detailed information. In course of time however, maps on scale of 1. 100,000 were adopted and they were readily used in mining, land improverment and industry.

Map that is useful to the Agriculturist

A geological map drawn to the scale of 1. 25000 gives a fairly accurate idea of the geology of the district mapped as in a map made on that scale 1 25 hectares go to 1 sqr centimetre. This can provide the agriculturists and foresters as well as the land improver with important information that would form a basis for better soil cultivation and for soil improvement.

This can, of course, only represent, in a general manner the relation of the soil and the subsoil. It can give the broad outlines of the district with its villages, net work of roads and its water courses. The various geological formations in such a map are represented by colours. Places of similar altitude are connected by contour lines which give an idea of the nature of the ground. The sections at the side of the map show the superimposed strata and their thickness while the chief character of the soil is denoted by ordinary symbols; dots representing sand, circles gravel, oblique shading clay and so on.

Preparation

The great object in making this type of map is to introduce all the data required by the agriculturist without sacrificing clearness and legibility. Scientific soil investigation and the results of experience may be combined by making enquiries from practical agriculturists from the point of view of utilization, working and manuring of the soil, the cultivation and yeild of crops and by pacing the fields, these results being afterwards embodied in the soil maps. The facts of chief interest to the agriculturist are to be expressed by means of different colours and symbols, the clay to be coloured violet, marl brown, sand yellow and so on. Other types of soil such as clayey, marly, sandy can be represented by shading, perpendicular lines being used for clayey soils and oblique lines for marly soils. Sandy soil can be represented by dots and gravel by circles. If it is necessary to depict the condition of deep seated layers, this should be done in a very sparing manner by means of colours and symbols. The thickness of the soil above the subsoil should be represented in red figures. The details required by the agriculturists are to be given by the sections on the margin of the map and the list printed in the explanatory text.

The use

These maps show the condition of the soil, the nature of the subsoil, the underground water supply, and their connection with the formation and conformation of the ground, thus affordig a valuable index for the kind of crop and fruits to grow. These data are also of paramount importance for the determination of crop distribution and rotation as well as being a useful guide in carrying out farming and improvement schemes. These maps in many cases render it possible to estimate the value of the results obtained from cultivation and manural experiments and show the cultural operations necessary and also the implements and amount of work required to carry them out.

The vegetation and growth period depend not only upon climate and the texture of the soil but also upon subterranean conditions. Seeding and crop yeild, cultural operations and harvest all depend upon soil and climatic conditions. A knowledge of the chief types of the soil, its nutrient contents and absorptive power enables the agriculturist to decide whether his land as a whole requires dung, green manure, or whether the best results are to be expected by the application of chemical fertilisers. Very often substances important for agriculture are found in the more deeply seated layers, as in gravels, clays, lime and marls while often soil itself is of a texture to be used in the manufacture of pottery and bricks. These maps will also be useful in spreading knowledge of the soil conditions and improving the present method of cultivating the land.

Their Special use

Geological maps are specially useful to those wishing to learn quickly the soil conditions, to agricultural advisers, tax assessors, business people engaged in buying and selling, renting and mortgaging property.

They are specially useful for large estates where it is wished to obtain an accurate knowledge of the land in order to cultivate systematically, for land and experimental fields belonging to agricultural schools and Institutes, for fields where cultural and manurial experiments are to be carried out according to a given plan, for land improvement experts and for communes wishing to improve their land thoroughly.

Lac Cultivation and Industry.

(*R. N. Gadre, IV year.*)

The object of giving the description of lac cultvation is to give the readers an idea of this important and paying industry. This can be undertaken as a side industry by the cultivators as we find in every village there is some land by the side of the nalas which is unfit for cultivation and where we can easily have the crop on which lac can grow. It is here that we find proper field for lac cultivation as it does not interfere with grazing of cattle on the other hand it makes an otherwise unproductive field, a source of profit.

Lac is a resinous excretion produced by an insect which sucks the juice of a plant and transforms it into resin found surrounding the twigs into which the insect lives. This insect belongs to a group of insect called coccidae, commonly known as scale insect. It is found growing on a large number of trees, but is especially grown on the Kusumb (Schleichera Trijuga), Palas (Butea frondosa), Ber (Zizyphus jujuba), Peeple (Ficus Religiosa), Siris (Alhizzia lebbek) & Babul (Acacia Arabica.)

The cultivation of lac is a very old industry and was known to the ancients. The very name of Laksha Taru (Lac tree) shows that the early inhabitants of India utilised the tree for propogating lac insect. In more recent times it is mentioned in the *Ain-i-Akbari*, where it is said that the lac was collected for making varnishes for use in Imperial palaces.

In the beginning it was much collected for the lac dye it contained. But when the aniline colour became known, the lac dye demand was diminished. At present it is thrown away and the manufacturers prefer a stuff free from colouring matter.

Trees on which lac is grown.

1. Palas—The lac obtained from this tree is rich in colouring matter and for this reason the lac obtained from palas is known as Rangin lac (coloured lac). But the resin that is obtained is inferior only to kusumb lac in quality.

2. Kusumb—It produces the largest and best kind of lac. It grows well in moist climate. The Kusumb wood lac if put on Ber or Palas produces a very heavy crop which is better for seed.

3. Peeple—The resin obtained from this tree is pale yellow in colour and is consequently used extensively for manufacture of low grades of shellac or mixed with palas resin to impart colour.

Besides it is tried on Ber, Saras, Babool, Tur and also on Litchi, Mango and Custard apple but the latter being fruit trees, are not used for breeding the lac insect. The largest quantity of lac is obtained from C. P. and specially from Chattisgarh and Nagpur divisions from lac cultivation.

Localities suited for lac cultivation

Places neither too hot nor too cold with 30 in. of rainfall are suitable Moisture is a greatest necessity for the successful development of these insects but more moisture injures the crop. Extremes of heat and cold retards the growth of insect. Dry and arid places should be avoided at the time of starting the cultivation. With heat the resin melts and blocks the holes through which the insect breathes and so it dies of suffocation. The success of lac cultivation depends upon climatic conditions.

Life history of lac insect.

If we examine a twig covered with lac we will find a number of resinous globules adhering closely to the stem. These are the full grown females containing fertilised eggs. When eggs mature, small deep red insects come from a hole situated at the posterior end of the body of the female and begin to wander about in search of suitable places to fix them-selves. This happens twice in a year. The dates of emergence of these tiny insects vary according to the food plant on which they grow and also according to the climate

When the larvae emerge out, they are sluggish and wander about in search of suitable places to fix themselves. When once fixed they cannot be removed. At this time there is very little difference between young male and female insect. They suck the sap of the tree. The sap is gradually transformed and is given out uniformly through pores all over the

body in the form of resin which after a few days completely encases them. They then moult and begin to feed actively. If the insect is female it remains fixed once for all. From these cells or globules of resin thin whitish hair come out which carry air to insects in the cell. Thus both cells continue to grow until the winged as well as wingless males emerge to fertilize the females. After fertilisation the females develop more. They take up more sap and consequently exude more resin and swell up. The respiratory hair lengthen out and the branches covered with lac appear white from a distance. If this whiteness is not seen then it may be due to the killing of females. The female grows and three weeks before the emergence of larva she ceases to feed and her body shrinks as eggs are laid. So for the seeds the branches are cut a fortinght before the coming out of young ones.

Preparation prior to inoculation

The most important factor to note in this case is to know the local date of emergence. This varies from place to place and from plant to plant. For this it is better to mark it once, some time between May and August for summer, and October to January for winter crop. Having noted this, cut the lac bearing branches a fortnight before the emergence. These are again cut into small pieces of 8 to 10 as in the case of sugar cane sets These pieces or sets are then dried in airy place in shade. At this time the sticks are turned and examined. When the deep, red, tiny, insects are found to crawl on the sticks the plantation or sowing as it is called, is done. These sticks are taken to the plants and are tied as such to a luxuriant growing branch by some available cheap fibre. Where plants are large in number and labour is dear, it is cheaper to use bamboo receptacles with 12 to 15 sticks in each. At the time of sowing there should not be either rain or storm. The Kusumb lac is healthiest and grows well on Ber and Palas.

The price varies a great deal from place to place. The great advantage in this work is its simplicity, inexpensiveness of material required to start and carry on the work and the noninterference in the Agricultural operations throughout the year. The produce from Ber tree is 5 to 8 times on an average the quantity applied to it. It is found that the cost of propagating lac on kusumb tree comes to about 5/8/- and the produce values at Rs. 10/- Similarly on an average the net profit per palas tree can be calculated at annas eight per tree.

When lac is scraped from the sticks it is known as "Stick lac." If this is exposed, it forms a compact mass known as "Agglutinated lac" The stick lac should not be kept in gunny bags. It is better to sell it off, or it be washed and the lac dye used as manure and the "Seed lac" stored as such. The stick lac is first ground with an ordinary hand mill

and soked in water for about 24 hours. This is then rubbed with hand and washed again. This is repeated until colouring matter known as lac dye is separated. Then a little washing soda is added to this at the rate of 4 chataks to a maund (40 seers) and the whole thing is rubbed and water added. This removes the last trace of colouring matter. The resulting material is known as " Dal " the granular seed lac and " Gund " the dust. The lac dye is then precipitated either with quick lime water or oxide of tin.

By washing we get two things i. e. pure resin known as Dal used for manufacture of shellac and Lac dye. Before the introduction of aniline colour this was extensively used for colouring wool, lether and silk and gradually represented the manufacturers' margin of profit. But now it is of little use and more price is paid for a material containing smaller quantity of colouring matter. It can be used as manure as it contains about 014 °/° of Nitrogen in form of ammonia and as albuminoid substance. One sample with sp. gra. 1.003 was found to contain 14 °/° Nitrogen; 004 °/o Phasphoric acid & 008 °/o Potash.

To the granules is added 2 to 3 °/° of yellow orpiment to impart colour and 4 to 5 °/° of Pine resin to lower the melting point. This is then thoroughly mixed and filled into long bags about 10 to 12 yards long. The bags are made of drill. The long bag fitted with the granules is twisted by an instrument known as Phirki while the other end is held by an expert worker who sits near an open oven. It is then well mixed and this passes over to a man who puts this semifluid mass over a porcelain cylinder containing hot watar and spreads it out uniformly over it with a sheath of palm leaf. This sheet is removed from the cylindar and is drawn out in thin sheet of 5' by 6' by holding two ends in hand and the other two under the thumbs of feet. This is done by a skilful labourer who draws it uniformly. This when dried is broken into pieces of uniform thickness. The pieces that are not uniform are rejected and heated again. This is known as chapda lac.

Local and foreign uses of shellac. Lac is used:—

1 By goldsmiths for fitting ornaments.
2 For making bangles, toys etc.
3 For making shutters, bobbins and sealing wax stick and bracelets.
4 For making Grinding stones and fixing handles to swords.
5 For Gramophone records.
6 As a constituent of varnishes and polishes for furniture and metal.
7 Litho-graphic inks.
8 As a stiffening for silk and straw hats.

Necessity for the Improvement of cattle.

(*J. V. Takle. L. Ag. N. D. D. Extra Assistant Director*)

Many a time it is said that our future prosperity lies in our live stock and unless the live stock is improved the present low yield of crops and the present fertility of the land will not improve. It is said that the Indian cow used to give 20 to 25 seers of milk per day and draught bullocks used to walk faster than horses. Only about 25 years ago, as older people will testify the country cows used to give about 5 to 6 seers milk per day on an average while they now give only a seer orso; bullocks also could do more work than what they are doing now.

From facts mentioned above it is quite evident that deterioration of our cattle has taken place and this is due to three main causes.

(1) Bad Breeding i e. indifference shown by the people towards breeding and selection.

(2) Bad feeding or carelessness in feeding young stock as well as adults.

(3) Overstocking i. e. keeping more animals than can be kept in good condition.

This unsatisfactory state of things of cattle has led to an abnormal rise in the price of good cattle, crops, milk and its products on one hand and on the other to the poor physique, prevalence of diseasess and an abnormal death rate among the people, especially amongst women and children due to lack of good and sufficient milk. It is not that we do not know the value of keeping a good bull in our herd for improving the cattle but it is due to indifference shown with regard to this that our stock has deteriorated. Nearly all elderly persons know the sound principle that the best must be selected for breeding or propagating purposes. This principle is followed with great advantage by many farmers in selecting their seeds for various crops. It was customary among us to keep one or two bulls of good type for breeding purposes and these bulls were called Brahmini Bulls. The underlying principle of this custom was to give free service of good bulls to all the cows of the cultivators and thereby improve the stock, but the custom is becoming extinct owing to the general indifference of the well-to-do classes towards cattle keeping and breeding and if immediate steps to improve the condition of our cattle are not taken the deterioration will go to such an extent that it may become impossible to till our land owing to lack of good draught bullocks.

If we trace the history of all civilized countries with regard to the improvement of live stock we will find that about 100–150 years ago the condition of their cattle was no better than what we have to-day but the constant efforts made by certain enterprising landholders and farmers have resulted in the value of well-bred cattle being appreciated by the whole farming community. The use of good bulls and the selection of good cows for breeding has resulted in the production of animals giving 80 to 100 lbs of milk per day. It is true that in England and America bullocks are not used for cultivation purposes but they are bred for beef production, whereas in India the bullock is the chief animal used for tilling our land so that it is necessary for us to pay more attention to this side of improvement than any other nation. What can be accomplished in other countries for beef and milk ought to be carried out in India for draught and milk. In United States of America, thousands of acres of land were rejected for want of fertility but opening of breeding farms on those lands has brought them to a perfect state of fertility. We have to face many difficulties no doubt in competing with other nations and with the present circumstances as we find every day there is rise in price of grain and other feeding stuffs. We must produce more grain crops with the same acreage if we are to reduce the cost of living to an increasing population.

The productivity of our land cannot be improved but by efficient tillage and manure. The time has come that our old tillage implements must be replaced by the improved implements such as Iron ploughs and many others; without the introduction of heavy tillage implements we will not be able to cultivate our land properly and so increase the crop production. Naturally when these heavy implements are introduced we must have stronger bullocks to draw them and these stronger bullocks could not be produced unless we pay more attention to cattle breeding on systematic and scientific lines.

Value of a good bull—The primary importance of using a good bull in a breeding herd can not be over emphasised. By using a good bull one can expect good calves while by using bad bulls in the herd bad calves are sure to be produced and even after taking their utmost care in feeding etc, they will not grow into good bullocks and cows and to maintain such animals will be uneconomical. Therefore great care should be taken in choosing a good bull.

There are certain natural laws which govern the breeding of animals and which can be applied by the breeder of domesticated animals in his work of improving live stock. First of these is that 'Like produces like'. This law operates in everything that relates to the health, vigour and fixity of type in the offspring. To maintain these characteristics nature provides a

system of selection which prevents deterioration by securing the most vigorous sires for the perpetuation of the breed. Each wild animal is of similar type to its ancestors and while there is no marked improvement there is no marked deterioration in any respect. Amongst wild animals the process of elimination of weak individuals is carried on efficiently through the strongest male in the flock or herd, driving out the weaklings and becoming the progenitor of the young so long as he retains his vigour; but he is driven out by some more vigorous male when he becomes weakened by old age or accident. In this way nature seldom allows the unfit to reproduce themselves. This clearly shows how wild animals and birds remain true type by natural selection and the survival of the fittest. It also points out to us the lines which we should follow to ensure success viz., the elimination of the unfit and the retention of those which show valuable characteristics.

This can not be done by many individual cultivators for many reasons, at any rate for the present as it entails large outlay and requires knowledge of this breeding science. In order to make progress more quickly government has decided to undertake the provision of pure bred bulls to those who require them and also to encourage and assist private individuals to take up cattle breeding on improved and scientific lines. To provide a nucleus of pure bred bulls, Government has opened a number of breeding farms for different breeds and in different localities where rigid selection is being practised with a view to improve the breed either for milk or draught or both together. From these Government Farms the farmers can secure bulls which will be strongly bred and capable of producing good stock while the farmer is spared the loss of time, study and expense which he would have to meet provided he undertook to breed such sires himself. It is, at the same time necessary that private cattle owners should also take up this work as the bulls which Government can produce are a very small proportion of what is required.

World's Famous Aviator.

The art of Aviation is progressing at a tremendous speed. Alan Cobham completed his most wonderful and adventurous flight from London to Melbourne on August 15. He was given a great welcome at Melbourne on the completion of his 13000 miles' flight. The famous aviator has given a thrilling account of his adventurous flight in Pearson's magazine July 1926.

The dusting of cotton fields with arsenate of lime by the airplane as a boll weevil remedy has been adopted commercially in U. S. A. This method of poisoning may even find a place in the regular routine of the large cotton planters in India.

Review of agricultural operations in C, P. 1924-1925.

The year on the whole was fairly prosperous. Almost all the crops gave normal out-turn and the economic position of the agriculturists was satisfactory.

Crops.

India is the largest exporter of rice in the world and rice its most important crop is the only known crop which can be grown without an elaborate system of drainage. The out-put, however, depends upon the rainfall. Our efforts therefore, were directed to meet the critical period of the monsoon in the Northern circle which is towards the end of August and the agricultural department has succeeded in obtaining on the Adhartal farm a variety which matures in 69 days and yeilds without irrigation, 800 lbs of grain per acre and has discovered at Labhandi a dark skinned rice of high yeilding power which will be valuable for Chhatisgarh division.

Pusa 100, Hoshangabad white Pissi, A089, AI12, A113 and A115, hybrids are the varieties of wheat found suited to different districts of our provinces.

Juar is the most important of millets grown in the Provinces. It serves as food for man and beast—Saoner, Ramkel and Lamkansi have been recommended as high yeilder. Copper Sulphate and Copper carbonate are recommended as preservation for Juar Smut.

With cotton, the most paying crop, the local branch of the Central Cotton Committee is carrying on experiments which promise very valuable results in case of Oomaras type of cotton and cotton wilt disease. The Agricultural Department continues to distribute the Roseum cotton seed.

The cultivation of sugarcane is attracting more attention in Chhindwara and Betul. Coimbatore varieties have shown distinct superiority over Khari, the local variety. The most economical 4 year rotation cane, ratoon, ground nut and wheat and then ground nut alone has been found out. It has also been shown that if full benefits of irrigation are to be reaped, applications of quick acting manures is necessary.

The Agricultural Department is now successfully growing the Egyption clover and soil renovator, and is attempting storing fodder in dry state or as ensilage.

Fruit culture

There is a wide scope for fruit culture in these provinces. This industry can attract a large number of educated classes and can afford to employ them, but hitherto there have been only isolated efforts The fruit trees of temperate and sub-tropical zones are making good growth on the experimental farm at Chhindwara, but a thorough investigation of the economics of fruit industry is very necessary.

Diseases of crops and Insect Pests

Experiments in foot-rot in wheat show that early sowing of wheat in Nagpur District tends to render the plants more susceptible to the disease, the fungus isolated in a pure state from wilted cotton plants show internally the same characterization as mature plants do when they are reaching their end of their seasons' life.

The Agricultural department has long been recommending chaffing Sorghum Kadbi fodder cutter which not only effects an economy in fodder but also reduces the number of resting larvae of the Sorghum borer by about 50 per-cent.

Agricultural Engineering

The improvement of the efficiency of the existing wells and tanks forms one of the chief planks in the programme of Engineering section of the Agricultural department. The designing and testing of agricultural implements is its another important activity.

The department has newly designed a reversible blade bakhar and a grubber for cleaning the land of Sorghum and cotton stalks. Other implements under trial are a clod crusher and a winnower.

Agricultural Education

Three grades of agricultural institutions are maintained by Agricultural Department. The middle schools provide Agricultural training for sons of tenants and small Zemidars who intend to take up farming on leaving school. The college has a double function. It trains men for the department and imparts instruction to enable them to become private farmers and estate managers.

The Chankheri school failed to attract students and was closed but Pawarkhera school has gained in popularity. The Agricultural college was affiliated to the local university, in 1925 and will now send up students for L. Ag. Examination in 1927. In 1924-25, five students obtained diploma and the same students the certificate in the final examination. A course of lectures on various aspects of agriculture was also arranged for young officers of the Indian and Provincial civil service to give them insight into the work of the department and to show them bearings of improved agriculture upon welfare of the rural community.

Co-operative movement.

The lack of capital is the greatest economic evil from which an Indian agriculturist suffers. Co-operation, therefore, was first applied to cultivator's indebtedness. With the numerical increase in credit societies, a knowledge of the principles underlying Co-operative work has gradually spread among the people and they are being applied to other branches of business besides the borrowing and lending of money. Although the number of Societies declined from 4263 to 4142 and membership from 66710 to 61736, the working captial has arisen from 1, 21, 13, 318 to 1,35, 39,518, 16. The seed unions distributed 2222 tons of Roseum cotton Seed. Agricultural Association earned a profit of Rs. 5462 on a paid up capital of Rs. 27251. The Telenkheri Gaoli Society earned a net profit of Rs 7138 on sales of Rs. 29425; showing that the Co-operative organization of actual producers is the best possible agency to obtain a reasonably cheap supply of pure milk.

Live stock

Cattle play a large part in agriculture in this country than in most countries and cattle breeding industry has of late received great attention. There are in C. P. 9 cattle breading and 2 dairy farms where herds of all the district breed found in the province are being graded up by crossing with Sahiwal bull. On one farm, however, a pure Malvi herd is maintained and on the other a pure Gaolao herd with the object of supply of pure-bred bulls now in great demand. There is a keen demand for cattle bred by the department. 269 animals were sold from Government farm. 13 pure Gaolao bulls from Garhi farm fetched an average price Rs. 300 per head. The scheme for subsidising cattle owners, willing to maintain stud bulls for the public good, has made a fair start. 24 premia were granted during the year.

The total mortality was 28763 almost double that of the previous year. This was due to widespread renderpest. Intensive research was prosecuted at the Imperial Institute of Veterinary Research Muktesar. Means have been devised for transporting the virus for long distances for use in the active immunization of cattle by the so called serum simultaneous method.

District work

The district organization now embraces a very wide field. Co-operative societies, Agricultural Association, private seed farms, demonstiation plots, agricultural shows, lectures illustrated by lantern slides, plough making and distribution of popular literature. In the year there were 14 departmental and 4, 454 private seed farms at work which distributed 4199 tons of seed and sold 7672 iron ploughs, 1158 other implements and 4, 218 spare parts and 8 miles of pigproof wire fencing. 38 shops for sale and hire of implements opened in Berar earned a profit of Rs. 11460 on a capital of Rs 60000. The staff carried out 1758 practical demonstrations, delivered 41 lantern lectures and held 26 agricultural shows.

Problem of population in India.

(*N .K. Das, L. Ag.*)

THE classical theory of population propounded by Malthus is well known to every one since Malthus published his " Essay on the Principle of Population " in which he sought to establish the theory that the population of every country, tended to increase beyond the means of its food supply. This implied that every civilized country, under stable Government, was gradually approaching a state of misery when people would not find food enough to eat. The excitement created by this doctrine in certain quarters almost amounted to a panic. But the Malthusian theory has since been subject to much criticism. While the fundamental facts on which the theory is based are not denied, the food supply of a country is no longer regarded as the limiting factor of the growth of population. Some economists have tried to calculate the number of years after which the world's food supply would run short; but any such calculation is bound to be misleading. With the advance of science man has learnt to overcome many of the difficulties which present themselves in increasing the world's food supply. Agriculture has made gigantic strides; the yield of crops in many countries has been improved beyond expectation and the possibilities of increasing the world's future food supply by further improving the yield of crops and by bringing new areas under cultivation are enormous It is also now recognized that the healthy growth of the population of a country is determined not by the amount of food actually produced in the country but by the wealth that it can command Great Britain produces food hardly enough to suffice her for three months; but on account of the industrial revolution that has taken place in that country, she does not suffer from famine even though the density of population in England is more than three times as much as in India.

Due to the development of transport facilities it is now normally immaterial whether a country produces all the food it requires or it produces wealth of some other kind so as to be able to purchase food from outside. In olden days every country had to produce all the food it required. Now that the means of transport and communication have been considerably developed, the world's food market is open to every country. It should not however be supposed that national self-sufficiency is not a desirable thing. It is not possible to discuss the question here at full length; but it may be mentioned that a country that does not produce all the necessities of life and civilization may find itself in difficulty in the event of a war breaking out suddenly or it may be held in economic subjugation by other countries even during the times of peace. But at any rate, the population of a country is no longer limited by the quantity of food actually produced

in the country. It is yet too early, if not idle, to think of a time when the world as a whole will become overpopulated and the human race, pressed by the shortage of food will think of " colonising the stars ". Supposing however that it is quite likely to happen, of what avail is it to the practical economist ?

Let us now divert our attention to India and see how the theory of population operates in this country. India has a population of 318, 942, 480 equalling about one fifth of the whole human race. No one should however, suppose that the density of population in this country is very high. It is much lower than the density of population in many other countries. In India 177 persons live per square mile on an average. Whereas the density of population per square mile in some of the foreign countries is as follows:—

England	701
Belgium	658
Germany	348
Japan	339
Italy.	319

In spite of this low density the highest figure that has been arrived at with regard to the income per capita in 1922 is Rs. 116. This compares very unfavourably with the income per capita of the United Kingdom, United States of America and many other countries. In the United Kingdom it is £ 50, in U. S. A. £ 72, in Germany £ 30 and in France £ 38. The low national income of India shows itself in the low standard of living, high death rate, infant mortality, famine and in many other ways.

An examination of statistics shows that though there has been an increase of population in India during the last fifty years, the rate of increase has not been very high. Between the year 1872 and 1921 there has been an increase of population in India by 112, 780, 120 or about 54 per cent, whereas in England the population increased from 8,893000 in 1801 to 17, 928000 in 1921. During the decade 1911-21 the population of England increased at the rate of 49 per cent.

Against this we have the fact that the birth rate in India is higher than that in many other countries. But the growth of population in this country is retarded by the death rate which is the highest to be found. The following table shows the birth rate and death rate per thousand in some of the countries including India:—

Countries.	Birth rate.	Death rate.
England.	23	14.
Scotland-	22	15.
Germany.	30	16.
New Zealand.	23	9.
Denmark.	26	13.
U. S. A.	22	14.
Japan.	34	22.
India.	33	31.

The situation with regard to infant mortality is simply shocking. According to the latest figures, 197 infants out of every one thousand, born in the year 1921, died in the first year of infancy. This is the av erage figure. In the cities infant mortality is much higher.

The facts enumerated above point to but one thing, namely that though the absolute density of population in India is not very high, the income of the country is not at all proportional to the needs of the country. According to the theory of population, as it stands now, India is therefore overpopulated. The income per capita has no doubt increased considerably during the last twentyfive years but it is not yet enough for a sufficiently high standard of living. Economists have held that a low standard of living tends to decrease the efficiency of a people generation after generation. This becomes quite evident when we think of the effects of early marriage, high birth rate, high death rate and deplorable illiteracy prevailing in India. A low standard of living deprives man of all prudential considerations.

The most evident remedy of all these evils is to increase our active national wealth. Since the material prosperity of the Western countries has been chiefly due to the development of industries it would probably occur to anybody that India should also become an industrial country. The development of industries in India has already begun and she has vast potential resources which are awaiting development. With the development of industries a large proportion of the rural population will be drawn to the cities and thus the increasing pressure on agricultural land will be effectively checked. But industrial development cannot be the only economic ideal for India. Any scheme of increasing our national income that does not take into consideration the question of the improvement of agriculture is bound to be imperfect. India has been an agricultural country since time immemmorial. She is by nature endowed with facilities for crop production. About three-fourths of her population are directly dependent on agriculture in India, inspite of natural facilities or shall we say, on account of natural facilities agriculture has not gone much beyond the stage in which it was a hundred years back. The outturn of crops in India is much less than what it is in countries where Science has been brought to bear upon agriculture. The average outturn of rice per acre in Japan is twice as much as that obtained in this country. The average production of sugarcane per acre in India is about one fourth of that in Java and Hawaii. The average yield per acre of barley in the United Provinces in 1921 was 1300 lbs. Whereas it was 2105 lbs in the United Kingdom, 2935 lbs. in Belgium and 2198 lbs in Switzerland. Improvement of our cattle is another vital agricultural problem which demands solution. Indian cattle are generally speaking extremely poor

with regard to the capacity for work as well as for yielding milk. Scarcity of milk and milk products is one of the many causes of the general deterioration of health and infant mortality in India. There is ample room for improvement in Indian agriculture both on technical as well as on economic lines. One of the chief needs of our cultivators is cheap capital. In Germany this is provided by the Cooperative Credit Societies. Organization of such Societies in large numbers will do a great deal to improve the financial position of the Indian farmer Co-operative credit is but one aspect of Cooperation. The Co-operative movement has brought about a revolution in the agriculture of many of the western Countries. In a country like India where the custom of sub-division and fragmentation of holding is hampering the progress of agriculture it is impossible to exaggerate the importance of Co-operation.

Economists are of opinion that birth control is also necessary for India. The high death rate that prevails side by side with a high birth rate implies untold misery and waste of human energy. Birth control however is not calculated to stop the growth of population but to give rise to a more efficient nation. It will result also in a low death rate and hence there will be a net increase at a comparatively quicker rate. In countries like Australia, New Zealand, Denmark and Netherlands where birth control is practised, the birth rate as well as the death rate is considerably low and the rate of increase is not slower than where birth control is not practised One particular feature of the population of India is that it is not uniformly distributed over the country. As a result of this, the pressure on land in certain parts of the country has become so high that the average cultivator can hardly earn a hand to mouth living by cultivating his land. If therefore suitable conditions can be obtained for emigration from congested areas to those parts of the world which do not suffer from overpopulation, or a practical scheme be evolved for the re-distribution of population in the country, the present land hunger is likely to be considerably reduced. One economist has suggested the formation of a Labour Bureau which will find employment for the labouring population of congested rural areas in industrial centres or induce them to migrate to those parts of the country which can afford subsistence to a greater population than they have at present. The same economist also mentions that the duty of such a Labour Bureau will also be to secure for the labourers satisfactory conditons of living in each case.

I do not wish to increase the volume of this article by quoting any more statistics. Suffice it to say, that the problem of population in India is at present a problem of life and death and on the solution of this problem rests, to a great extent, the future of our beloved mother country, India.

Agricultural Education.

(*R. B. Ekbote III year*)

THE primal law of humanity is preservation, the first essentials of which are sufficient food and congenial shelter. The industry which feeds and clothes us must needs receive our foremost attention. In these days of Motor Cars and Cinemas the struggle for existence is supremely felt. The very existence of men living on the verge of starvation or leading nomad life is a proof of lack of organisation in the method of our labour. It is hardly necessary to say that full efforts of a single man can produce enough for himself and to spare. A very low rate of production in agriculture is the chief cause of penury of the people at large. An economic truism states that weal of a country depends primarily on its agriculture and its industries. Our country has a population of about 300 millions; of which nearly 4/5th depends on agriculture. Any sort of education therefore which takes no account of its relation to agriculture is bound to be disastrous. The education of our country centres round cities whereas villages remain in darkness—almost of utter illiteracy.

The authorities have been fully aware of these facts and have not been slow to improve matters. Recent years have seen a great improvement in the system of Education especially in its relation to agriculture and it may be said without exaggeration that the subject has received " An unwonted measure of attention ". The important conference held in 1901 under the presidentship of Lord Curzon led to a complete reversal of the old order of our system of education. A separate department of education was created The keen interest and special attention of Lord Hardinge increased the money grants. Agriculture and rural education have had a lion's share of attention and it is universaly recognised that the connecting of teaching in our Schools with our " chief and noble industry " is indispensable.

It was in 1904 when the attention of the Government was drawn towards agricultural education; and a policy for improving agricultural industry was initiated by Lord Curzon. The first aim of the policy was to restrict efforts to the improvement of industry alone but later the Government modified their policy which made agricultural education proper, a vital and fundamental part. The year 1835 marks a new era in the history of education. It was then that people began to realize the necessity of education after the manner of West and there was a demand for it. The craving for literary education existed in the elite classes and higher agricultural classes. These were the people prepared to take advantage of scientific education in Agriculture.

The development of Agricultural Department brought into existence the Agricultural colleges of the advanced type like our own. The admission into such colleges was open not only to the Agriculturists but also to such boys of non-cultivating classes as might have a liking for agriculture. At first there was no difficulty in filling up the Colleges but later years saw a marked decline in admisson of students until the year 1913 when some of the Colleges reached a crucial stage, and this matter was brought to the notice of the Board of Agriculture. It was found that the curricula were not suited to the class of students, they were intended for. Consequently, the Board of Agriculture suggested a compromise by lowering the standard. These *inter alia* would attract not only greater number of students but also better talents who require a true collegiate education centering round agriculture and these will take their places as leaders of rural society.

English agriculture derives its strength from its men who have a fair knowledge of farming and stock breeding. " It is the part of their life—*Noblesse oblige* is the reason for it and the fact is recognized from the King downwards. It is evident thus that this class furnishes the influential supporters in agricultural improvements. India needs the same. We can obtain such even by giving them an insight into the subject and teaching them that the better condition of ryots means their own advantage.

Education must forge men out of us. It must make the nation take its place as such in comity of Nations, and " hold its own in the great economic struggle of the future ". Education must produce a son fitter than the father rather than a renegade from ancestral calling. The present education is imparted without regard to parentage and future of the individual. It is no wonder therefore that more often than not it fails.

Agriculture means production of food and other requisites of man and the " aim of Science of Agriculture is the production in the best condition, of the greatest amount of produce in the shortest space of time at the least cost and with the smallest deterioration of land ". I need not emphasize the fact by saying that the national prosperity depends upon the dexterity of its people, its diverse developements and not super literary education of a minority. Any education which does not go deep enough to improve the chances of man to the uplifting of his country is worse than none at all.

Installation of agricultural colleges is not all in all. A student if given instructions in agriculture from the time he begins his educational career, is sure to become a sucessful agriculturist.

To get himself qualified for admission in Agricuitural College a student has to pass seven years of his life in secondary educational schools. During this time he is not given any knowledge whatsoever regarding agriculture but is habituated to training of book-work alone. Is it then strange that on his joining the College he finds himself in quite a separate world? The teaching of agriculture therefore is not only a facility but an absolute necessity. After all is it not better and beneficial to learn something of the industry which supplies him with food and clothing rather than merely to learn the names of various cities in the world? To facilitate teaching of agriculture, an agricultural graduate be appointed in each High and Middle School. A small plot near each institution be provided for students' *field area.* The provision of common but improved implements be made in each School. Students should be given instructions in the use of such implements and about common crops and gardening. Extra expenses to be incurred must be reckoned as unavoidable.

India being an agricultural country it is strange to find that no steps are taken to introduce elementary principles of agricultural education in rural schools. It is often said that the student's knowledge in rural schools is too insuffi-cient to enable him to understaud anything about the subject. In the higher classes of such schools if the students are taught the elementary principles of agriculture, taken on excursions in fields and taught arithmetic enough to maintain farm accounts then no difficulty will they find in grasping the subject. At least a fair trial should be given. If no attention is paid to teaching of this vital subject at this stage, we shall find students lacking in observation and practical initiative. Any way rural education must be given an agricultural bias.

Regarding the normal schools, the students taking training are intended to go back as teachers in vernacular schools. If these men are trained in agricultural education they can be of much assistance in teaching of agriculture in the vernacular schools. The subject "Nature Study" one is glad to note, is already introduced in the curriculum of normal Schools. What is wanted is to extend the course to bring in practical efficiency.

Special agricultural midde schools will prove highly useful in training the cultivators' sons in their ancestral profession. The education in such schools should be free and compulsory to the cultivators' sons. In the Punjab 43 such Schools are already in existence and it is gratifying to hear that they are a perfect success. In the Central Provinces such a type of School is existing at Powarkheda and in Berar provision for starting such a school is already made at Buldana, by the District Board.

Regarding the education of actual cultivators, a method of demonstration must be rigidly adhered to. These men being uneducated do not understand the value of scientific agriculture. To make them understand and convince them we have to show by practical demonstration what agriculture on improved lines can do in the amelioration of their material condition. So long as they do not value the importance of improved methods, demonstration on Government farms is of no use. The Education Board of the United States of America in diffusing the knowledge of improved methods to negroes shows that demonstration must be carried out on the cultivators' own fields. When they actually see that the improved methods are really economical and beneficial, they will readily take them up.

If qualified men in agriculture be employed in Revenue, Settlement, and Land records Departments, the demonstration method of teaching is likely to be easy and effective. The supply of capital would be needed for the introduction of improved methods. This will be obtained very easily by organising Cooperative Credit Societies which may ultimately finance all schemes of improvement.

In conclusion Agricultural Education must receive serious attention in secondary and rural schools. Equally the work of demonstration be paid attention." The cry all over the world is for skilled labour as it always will be and a man who is a master of trade is always sure of living.

THE VALUE OF HONEY AS FOOD.

When the food value of honey is reduced to figures, we are surprised to find that a pound section of honey (about 14 oz. net) contains as many calories as twenty eggs. Honey is classed among the carbohydrate foods, and is a source of heat and energy. When it is known that honey contains very little cane sugar, and consists mainly of grape sugar and fruit sugar, it will be realised that honey is a pre-digested food directly available for the production of heat and energy. This explains why honey is unsurpassed for the relief of fatigue, and enables us to understand why Jonathan, wearied in the pursuit of the Philistines, was so immediately refreshed by a little honey.

Nitrogenous matter occurs in the form of pollen grains always present as an accidental mixture and there is N. also in the albumen supplied by the bees in the elaboration of the honey. It has recently been shown that honey also contains those mysterious substances known as vitamines, in the absence of which an animal will lose weight although supplied with a food ration that is otherwise adequate.

——*Agri. Gazette. N. S. W. Vol.* XXX *Part 9.*

College News and Hostel Notes

GENERAL

Secretaries—

General Secretary:—	Mr. A. B. Dutta.
Secretary for Football:—	„ R. G. Kalambkar
„ „ Cricket:—	„ A. S. Bakre.
„ „ Hockey:—	„ W. R. Sathe
„ „ Tennis:—	„ N. Z. Ahmad.
Agricultural Association Secretaries	„ S. G. Kolte „ R. J. Kalambkar
Secretary for Hostel Library:-	Mr. R. B. Ekbote.

We congratulate our Entomology Lecturer Mr. J. L. Khare and our present Foot-ball Captain R. J. Kalambkar on their success in the B. Sc. Examination.

* * * *

We welcome Mr. S. K. Mishra who after a post-graduate training in Dairying at Bangalore Imperial Dairy Institute has come again amidst us. He is now appointed as a permanent Lecturer in the College staff and we expect the Dairy Instructions will now be after the Bangalore model.

* * * *

We learn Mr. Allan now the officiating Director of Agriculture had been to Simla in connection with the work of the Royal Commission of Agriculture. He had also been to Bombay to attend the sittings of the Central Cotton Committee. He has a busy time of it.

* * * *

Our Professor of chemistry and Hostel Superintendent Mr. Kayastha is now officiating in the Central-Provinces Agricultural Service vice Mr. D. V. Bal, who is in England. We learn Mr. Bal is soon returning to India in September next.

* * * *

We welcome Mr. Giddian B. Ag. (Poona) who has been appointed as an assistant in Mycology section.

* * * *

There has been an unprecedented rush of students this year and the College Hostel is packed to its utmost capacity. This number is the last straw on the camel's back. The inconvenience felt, we are sure, will not be overlooked and a general extension to suit the needs of the swelling numbers, will take place.

* * * *

Our Gymnasium this year is made use of by a number of students both in the morning and evening. The interest evinced by them indicates that they are not blind to the call " Health is wealth. " With some changes the Gymnasium promises to be a favourite place of resort.

* * * *

Our recreation room is very busy with the pleasant noise of the ping-pong ball. It is a matter of great delight that the students realise the value of recreation after the tiring work in the morning.

THE VICEROY'S VISIT TO OUR COLLEGE.

ENGLISHMAN'S love for rural life and habits is proverbial. His hands are equally fitted to wield a hoe as to hold a pen. But that rural industry would ever be the subject of attention of an Englishman risen to the highest rank of dignity and power, standing on the very summit of fortune, controlling the destinies of people at large and create in him a love for rural life and vocation, was dim belief of ours. Lord Irwin's Visit to our college, his pre-possessing manners his simple habiliments have done much to dispel the above hazy doubts. It is unique indeed in the annals of our college to which we have the honour to belong.

At the Research Institute on July 23rd, His Excellency the Viceroy was received by the Hon. Mr. Martin the Executive councilor and Mr. Allan Director of Agriculture. The officers of the staff having been presented, His Excellency walked to the Botanical Labortary where all the isolated and selected varieties of cotton, rice and wheat, the three staple crops of this province, were exhibited. Mr. Allan explained to His Excellency by means of charts, the position of India in world's cotton production and export of Indian cotton to the foreign countries. His Excellency was shown the neglectum varieties which are the local types, Buri, Bani and some selected strains obtained by crossing rough but prolific types with long and fine ones, and was explained the activities of the Cotton Committee. In the wheat and rice sections, Mr. Allan acquainted His Excellency with the chief varieties and demonstrated the local and improved methods of cultivation His Excellency seemed keenly interested.

Then there was a move to the chemical Laboratory. Dr. Annett our principal showed His Excellency the soils of the Province and explained some of the main problems under investigation.

His Excellency then proceeded by car to the college farmstead where there was a parade of implements and live stock. Here His Excellency seemed inquisitive from the very beginning. Mr. Allan explained him the local and improved implements with reference to their purpose and efficiency. He then took him round the live stock, showed him the college dairy breeds and explained the principles on which the improvements of aminals both for milk and draught purposes was being effected on the college dairy.

Some College students engaged in their practical work in the fields near by, caught His Excellency's eye who crossed the field fence and arrived at the spot and was much pleased to see the students working with their implements.

The last to attract His Excellency's attention was the operation of rice transplantation. Mr. Allan explained him the object and advantages of rice transplantation under different conditions. Through out his stay His Excellency showed a deep appreciation of the work done by the Central Provinces Agricultural Department. A veritable farmer as he is he wanted to imbibe all that fell from Mr. Allan's lips. His eyes and ears seemed all agog. In the 'Farmer Wood' as he is popularly called, India a hoary land known for its probity, has last found a friend and a benefactor.

After about two and half hours stay His Excellency proceeded to the Government House.

FOOT BALL.

Every year, we have to lose some of our good players. This year is no exception. N. K. Das who passed his L. Ag. last year in first class was a good goalkeeper of our team.. We are sorry he cannot give his services any longer to our college team. We wish him a prosperous career.

There are some good additions to our Foot Ball Team. We heartily welcome Chatterji who is very good in the goal and Naim who is an excellent centre forward.

It is a matter of great regret that all the students of our college are not entitled to take part in the University Sports. Only those who are eligible for the University Examination are allowed. We are therefore, greatly handicapped. We have to select the players from a very limited number. Last year we could not send our Foot Ball team for the Uiniversity Sports as we had to select student entirely from the first year. This year however we hope to put in a team as we can select students from the first and the second year I. Ag. classes.

Uptill now we played five matches in all. The second match was played against the Engineering School team when we scored 6 goals to nil. The third match played against the Bengali team on 11th Aug. was well contested and we were fortunate to score one against nil.

Dr. Annett our Principal, Messrs. Krishana Murti, Roy and Subbarao take active interest in the game. Mr. S. C. Roy our Games Secretary spares no pains in helping us.

If the players continue to show the same zeal as they are showing now, we hope to improve the standard of our game.

CRICKET ACTIVITY.

The cricket season is in full swing. We played two matches against High Road Club and Medical School respectively in both of which success was to the home club. In both the matches the excellent batting of Karnik was much appreciated; he scored 31 and 51 runs respectively. Our main bowlers are Joshi who captured 6 wickets for 15 against Medical School and Dange who, took 6 wickets for 37 runs against High Road Club.

As usual the match between the Staff and the Students was highly interesting. The staff were first to bat. Their score was slow and they were disappointed when their skipper Dr. Annett was unfortunately caught at the boundary. The entry of Mr. Allan, however, enlivened the game in partnership with Mr. Kelker. With a score of 56 to their credit their innings came to a close.

Karnik and Vaidya opened the students' innings. The unexpected falling of wickets in rapid succession dispirted the students but kindled a ray of hope among the opponents. The score stood at 23 for 7 wickets The partnership of R. D. Deshpande and K. B. Joshi revived the lost hope. At last Ramayya struck the winning hit and captured success for the Students. The total score ran to 86.

OLD COLLEGIANS AND THEIR DOINGS.

Messrs H. P. Singha and N. K. Dass who passed last year have gone back to the provinces they came from.

Messrs. Gangadhar, Malwatkar and N. R. Pande who passed last year have been appointed as Agricultural Assistants on College farm, Basim and Yeotmal farms respectively.

Our old Collegian Mr. D. V. Bal who was sent to the Rothamsted Farm—England by the C. P. Government for Bacteriology is returning shortly. We hope to hear a pleasant account of his stay in England.

Mr. P. Y. Deshmukh another old Collegian who had been to America to prosecute his Agricultural studies is enroute to India. We wish him a safe journey and arrival.

Another old Collegian Mr. Chaurey who some years ago was our Machinery Instructor is now appointed as Assistant Settlement Officer, a post he acquired by honest and good work

Indian Cotton and its Improvement.

(*R. A. Ramayya. IV year*)

THE importance of cotton lies in its commercial value. The introduction of machinery has given a great stimulus for the growth and extent of cotton and its trade. Cotton is valued for the cloth which is made out of it. When we come to realise how much cloth is valued by humanity, next to food, we find we are greatly indebted to cotton from which is manufactured the cloth we wear.

India produces in general a variety of cotton which to all intents and purposes is of a coarse character. The reasons for the coarseness of Indian cotton and the methods adopted in their improvement form the subject matter of this paper.

Nearly 70 o/o of cotton grown in India is consumed by mills in England, Germany and Japan. Fine cotton used to be imported by these countries from America. But large tracts of cotton belt in U. S. A. have been thrown out of cultivation due to the boll-worm attack. A shortage in one part of the world, gave rise to serious thought in England. Cotton Enquiry Committee was formed to investigate matters in India, with regard to the feasibility or otherwise of growing long-staple varieties. After such an investigation, came the introduction of exotics in certain parts, with a success in some of the provinces. Thus, in some parts of Madras like Tinnevelly, Kurnool and Bellary, there was introduced the Cambodia cotton which is famous for its fine staple. We find, that this introduction of cotton variety has been successful in those districts only. In some parts of Bombay like Dharwar and Hubli, was introduced an American variety which being acclimatised is now commonly known as the "Dharwar American". With the irrigation scheme development in Sindh, there came in existence the growth of such a valuable crop as cotton and that too a fine-stapled variety–the Egyptian variety.

The chief tracts in India where cotton is largely grown are Bombay, Central Provinces and Berar, Madras, the Punjab and some parts of Central India. The cotton in these parts of the country except the Punjab, wherein cotton growth is of recent introduction, was of a coarse variety.

The only pure variety of cotton grown in the Central Provinces and Berar was the long stapled Bani cotton. This had to give way, as we would give reasons further, due to the wide spread of the coarse variety Rosea. Due to a mixture being grown, we see that the important thing at issue

with the original workers of cotton was the isolation of the different varieties and thus arrive at pure one of different characteristics. Thus tracing the history of Indian cotton, we find the mixture commonly called *Jari* contained no less than four varieties. Viz. *Rosea*, *cutchica*, *Verum and Malvensis* and thus with the isolation we got the four pure varieties. Out of these, *Rosea* came to be favoured more, by the cultivators due to its hardy nature and above all due to its high and sure yield. The growth of this coarse cotton of a short-staple having made a name amongst the cultivators, it was very difficult to suggest a change. The efforts then were directed towards the selection of varieties by which the yield as well as the quality came to be improved. Even the finer varieties of cotton viz. Bani, Malvensis etc. which used to be grown in some parts and gave way to coarse cotton like *Rosea* due to the price offered by the Indian merchants and agents to this fine cotton, were far from being satisfactory. With the shortage of cotton supply due to the failure in America there came a death blow to the Lancashire and Manchester mills in England. Hence, attention was directed towards India. With the institution of Cotton Committee exotics were tried on different experimental farms. The success in the beginning was far from satisfactory in all Provinces. The failure in the growth of exotics is mainly due to the Indian climatic conditions which do not afford the required long period of growth, moisture etc. which are the essentials for such varieties of cotton. In the C P. and Berar the introduction of exotics was a total failure. Even in some parts where it was a success, the introduction of it among the cultivators was very difficult as they were quite averse to all new introduction or innovations. But with temptations and facilities afforded for its purchase with reasonable price, it was taken up slowly by cultivators and thus we get long-stapled cotton only in some concentrated localities. A great success was ensured in Sindh where a large area of land came under cultivation due to the system and scheme of irrigation which originated. Here was grown the Egyptian cotton. With the failure to introduce exotics in many parts of the country, attention was directed towards the improvement of the existing varieties suited to different localities. The main steps taken in such improvements are–selection, manuring, spacing and crossing or hybridization. The Akola Farm which yielded an average of 67 lbs. cotton per acre, when the farm was started, now grows an average of 500 lbs per acre. Trials were made on different experimental farms for the best kind of manuring and spacing which vary for different tracts of the country. In the C. P. and Berar experiments carried out at the Akola and Nagpur farms go to show that 8 to 9 loads of cattle dung followed by a top dressing of 66 lbs. of sodium Nitrate would give the best yield. With reference to the improvement by hybridization, the chief aim has been to evolve by continued experiments a variety which is a high yielder as well as a fairly good stapled one. Thus, in the

Central Provinces, out of the varieties *Rosea*-- a high yielder, *Bani Malvcnsis and Cutchica* which are good stapled, the department is trying crossings. Of the improvements which are directed towards cotton, trials made to remedy the wilt disease of cotton are worthy of mention

It is not out of place, here, to mention something about the cotton trade in India, its defects and remedies. Tracing the history of cotton growth we find, that in the beginning great difficulties had to be encountered for the transport of cotton. In one of his articles Gaurmie says that cotton was seen lying in the railway yards for days together exposed to sun, wind and rain and thus it earned a bad reputation among the industrialists. Now, with deputations and legislature, and with increasing value of cotton, such difficulties are done away with. Indian cotton is said to have earned a very bad name in the world market due to the intermixture of dirt. Thus the value of cotton and the money price paid for it has been low, due to the dirt intermixed with it. This objection raised against Indian cotton cannot be said to be false though it may no be wholly true. The chief source by which this dirt comes to be intermixed is the carelessness in picking. The pickers usually female coolies are not taught the importance and value of cotton. They pick generally cotton mixed with earth and leaves. Besides, if care is not taken to adjust the time of picking, the bolls falling down are intermixed with dirt—earth and leaves and they are thus collected. Thus, we find that for pure and clean cotton this defect in the mode and time of picking has to be remedied.

A great draw back in the Indian cotton trade is that the cultivators market their cotton with a mixture of varieties which lowers the value of the good stapled cotton by fetching only a low price. The last but not the least important fact is the difficulty encountered in marketing the product. As the cultivators are small farmers the cotton grown on each scattered holding has to be collected and sent over a great distance to reach the market centre. This difficulty can be remedied by starting cooperative societies which should facilitate the farmers in marketing their small quota towards the national wealth of the country.

The future of Indian cotton lies in the improvement and wide spread of existing good varieties amongt he cultivators. Besides spreading the growth of these varieties,care must be taken to keep the variety pure without any contamination. This would be possible by opening seed farms both of Government and private enterprise which would naturally supply pure seed to the cultivators. Besides, the future of Indian cotton trade lies in growing longstapled varieties, because, with the increasing knowledge in industrial spheres, the cry has been for long-stapled cotton. Even Japan and Germany in due course of time will have no demand for shortstapled varieties and hence, if care is not taken from now to increase the acreage under high quality of cotton, we may have to rue the bitter effects of shortsightedness. Besides being an individual loss, it would be a national calamity. The

growing need of the Indian mills have also been towards finer cotton and hence it is high time that we realise the value of fine stapled cotton in preference to a coarse one.

Any shortage in any part of the world is sure to affect the Indian cotton trade. Hence a knowledge of the world's cotton trade is essential to the cotton grower of India; so a wide diffusion of knowledge of Agriculture among the masses on an industrial basis is necessary to keep up the economic balance of the world's trade in cotton.

Loyalty to the employer.

If you work for a man, in Heaven's name work for him. If he pays you wages that supply your bread and butter, work for him ; speak well of him, stand by him and stand by the instituti n he represents. If put to a pinch, an ounce of loyalty is worth a pound of cleverness. If you must vilify, condenm and eternally disparage, why, resign your position, and when you are on the outside, damn to your heart's content. But as long as you are a part of the institution, do not condemn it. If you do, you are loosening the tendrils that hold you in the institution, and the first high wind that comes along. You will be uprooted and blown away and probably you will never know why.

Seven Mistakes of Life.

The delusion that individual advancement is made by crushing others down.

The tendency to worry about things that cannot be changed or corrected.

Insisting that a thing is impossible because we ourselves cannot accomplish it.

Attempting to compell other persons to believe and live as we do.

Neglect in developing and refining the mind by not acquiring the habit of reading.

Refusing to set aside trivial preferences in order that important things may be accomplished.

Failure to establish the habit of saving money.

WANTED

1. Suggestions for our college ' Motto '
2. Designs for the college ' Emblem '

Correspond with The Editor, Agricultural College Magazine Nagpur.

NAGPUR

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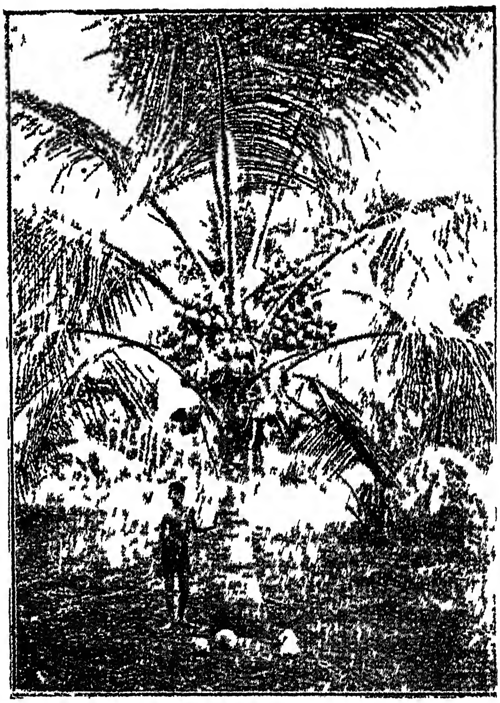

The Cocoanut Tree.

Agricultural College Magazine.

It is by the contact of different types of mind and on diverse lines of inquiry that the spark of true knowledge may be struck. —Lord Irwin.

Vol. 1 **October 1926** *No. 3.*

Editorial comments.

The style is the man. An agriculturist, a botanist, an entomologist in short, a man of science is as a rule a dry-as-dust fact hunter. One would naturally expect the writing of men of science to be as unimaginative, as inartistic as science is supposed to be. Yet we have the familiar examples of Dante, Keats, Franklin, and Homes on the one hand and Huxley, Fabre and Darwin on the other which indicate that there is no necessary incompatibility between the so called scientific cast of mind and the capacity for artistic expression in words. A scientist can be a masterly writer and a writer can be a great scientist. Shakespear's lines bristle with scientific allusion. Milton knew the science of the sixteenth century to its depth. Tennyson's poems breathe the truth of geological philosophy revealed at the time. Instances can be multiplied. It was Lyell's masterly exposition and lucid style of the 'Principle's' which forced the new geology upon the popular attention. Darwin, arranged and presented his facts in such a fashion as to carry the reader forward to the conclusions at which the author aimed. Both Tyndall and Huxley lifted the reader over any difficulty and visualised the subject before him in an enticing form.

Such a union of science and art can certainly be realised and scientist will have done a great service to mankind if he creates love for scientific subjects in popular minds. The work is by no means difficult. We have only to think of things as they truly are, to see them as they really are and to state them as they actually are.

* * * *

Puzzles, Prizes and Puns occupy a prominent position in a modern newspaper, the object seems to be three fold. Amusement, Instruction and Advertisement. Obviously the last named is the chief end in view. Often one tries a cross word puzzle or enters a competetion to compose poems on 'Sports man's cigarettes' or a 'Fiat Car'—only to court failure and to learn to his great disgust and mortification that some unknown from the fairy land has carried away the prize. Whatever the purpose of the othre journals, we have instituted a prize competition with the avowed object of encourging literary habits and a habit of close, minute and accurate observation while the students are at college and after they leave it.

* * * *

We wish *to* encourage among our young folks habits of research. The habit ought to be encouraged for the benefit of the student, the addition of human knowledge, power and riches and the needs of defence military and industrial. The spirit of research is like the movement of running water and the absence of it like the stagnation of pool. Scientific Research, in its widest sense, implies of course far more than exploring the question of physics and chemistry and biology. It is not religion, but it is the act of one. It is the outcome of a belief that in all things which we try to do we may by careful seeking and by a better understanding do them better; that the world far beyond what we can see of it on the surface, is full of things which it would be well for us to know. It is our duty and our gain to explore: we have always grown by doing so and we believe that the health of our souls depends on doing so. Shall we sit still when there are difficult questions to solve; when the answers may give us new insight and new power? There is a hesitation which would beg us not to push forward lest we come to think less of the world. As against this, research is an act of faith in the immensity of things. There is no end to the search; it is a poor thought that there might be.

The spirit of research would drive us all to work to the utmost of our powers, believing that the more we do and the better we do it the better for the work and lives of others. It is vigorous, hopeful, trustful and friendly; it adds always new interest and new life. It is a spirit which should run through all our activities and not to be found in laboratories only. It is in fact a spirit which is essential to us as a nature trying to rise above ourselves to better things.

It affords us extreme delight that the sphere of our readers is extending rapidly and we now feel sure of the possible assistance our readers can render us. We also express our deep sense of gratitude to the past students for the prompt response given by them to our appeal. We request them now to become our 'Special Correspondents' for their respective districts.

* * * *

Success in farming is the outcome of Nature's endowment and man's activity. Both these must go hand in hand. In the Central Provinces and Berar one of the saddest ironies is the lack of irrigation facilities which leaves agriculture mainly at the mercy of monsoons. the late appearance in July and continuous downpour accompanied by cloudy weather in the month of August and early part of September have caused no small amount of damage to the kharif crops especially cotton and Juar. On the drained soils however the loss is comparatively less and is superficial. This shows the efficacy of "Underdrainage," one of the chief features of land improvement on the stiff and retentive soils.

* * * *

We beg to draw the attention of our old collegians to a desire expressed by one of them to restart the 'Old Boys' Association' that existed before. We feel sure that the call will be duly responded and the necessary and prompt steps taken towards the renewal of the Old Boys' activity.

THE ROYAL COMMISSION.

PERSONNEL—Marquess of Linlithgow, Chairman; Mr. Hubert Calvert; Professor Nogendra Nath Gangulee; Dr. Lodhi Karim Hyder; Mr. Balkrishna Sitaram Kamat; His Excellency Sir Henry Stavely Lawrence; Sir James Mackenna; Sir Thomas Middleton; The Hon. Raja Srikrishna Chandra Gajapati Narayan Deo of Parlakimedi; and Rai Bahadur Sir Ganga Ram.

OBJECT—The Commission is generally to examine and report on the present conditions of agriculture and rural economy in British India and to make recommendations for the improvement of agriculture and the promotion of the welfare and prosperity of the rural population. The Commission is particularly to investigate: firstly, the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new or better crops and for improvement in agricultural practice, dairy farming and the breeding of stock; secondly, the existing methods of transport and marketing of agricultural produce and stock; thirdly, the methods by which agricultural operations are financed and credit afforded to agriculturists; fourthly, the main factors affecting rural prosperity and the welfare of the agricultural population.

A NOTE ON POLLINATION AND ITS ECONOMIC IMPORTANCE ON SOME OF THE CHIEF CROPS OF THE CENTRAL PROVINCES AND BERAR

(K. P. Shrivastava, Extra Assistant Director of Agriculture).

(*Concluded from our last issue*)

Bajra

In this Province, Bajra (Pennisetum typhoideum) is grown as a rain crop in the lighter soils which are practically unsuitable for more important crops. It occupies an area of 151,385 acres and is mostly grown in Buldana, Narsingpur and Nimar districts, and forms one of the staple foods of the poorer classes of these localities.

FLOWERING AND POLLINATION:–The inflorescence of Bajra consists of a cylindrical spike of about 4 to 18 inches long and $\frac{3}{4}$ to $1\frac{1}{2}$ inchs thick, the rachis being covered over with spikelets. In each spikelet there are generally 4 flowers, but sometime upto 8 flowers are found. Of these, generally, one or two flowers are fertilized and set the grain while the rest remain undeveloped. There are three anthers in each flower, and the filaments are long, delicate and thread-like. The stigma is bifid and feathery. The stamens and the stigmas in the spike do not attain their full development at the same time. The stigmas develop and become receptive long before the stamens come to maturity. Thus the plant is protogynous. As soon as the spike is out of the leaf sheath, the tips of the stigmas from the flowers at the apex of the main spike begin to make their appearance. It takes about 48 hours for all the stigmas of the whole spike to come out fully. They begin to fade in the same order in which they come out, and shrivel up in about 4 days after first appearance. After wards the anthers begin to come out, their tips being first visible through the glumes. The coming out of the anthers is rather irregular. In the majority of cases, those at the apex of the spike come out first. In some they appear from the middle portion of the spike and rarely from the base. It takes about 36 hours for all the anthers to come out on the whole spike (See table No. 3) The filaments, when they come out of the glumes, are erect and remain in this state for about three hours. During this period the anthers begin to dehisce at the apex through a slanting slit which gradually increases till the lobes are fully burst. Later on the filaments droop and the anthers hang out from them and a light movement of the spike causes a downpour of pollen grains.

The dichogamic condition of the development of stigmas and anthers, and the marked interval of about $3\frac{1}{2}$ days between their maturity clearly shows that self-pollination is distinctly avoided and cross-pollina-

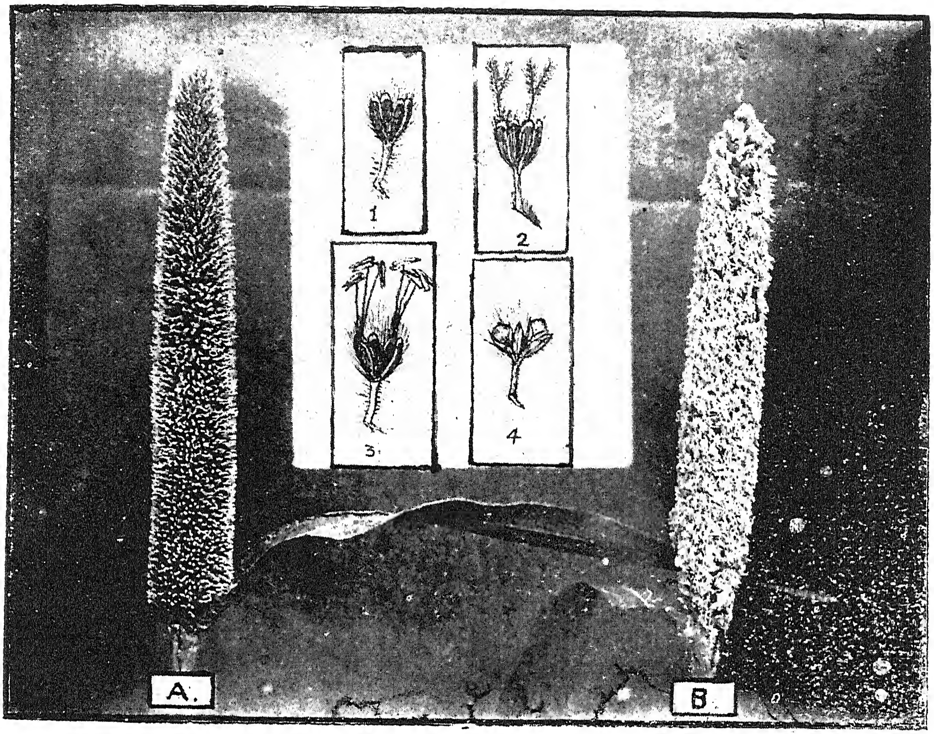

Fig 4 A spike showing the appearance of Stigmas
,, B ,, ,, ,, ,, ,, ,, Anthers.
,, 1 A spikelet with four flowers
,, 2 ,, ,, ,, two bifurcated Stigmas
,, 3 ,, ,, ,, six anthers
,, 4 ,, ,, ,, two mature grains.

tion is assured. In this plant, wind and insects play an important part in the transfer of pollen grains. When the anthers are newly burst, a slight gush of wind carries lot of pollen dust to the neighbouring plants, and thus effects cross-fertilization. In addition to this, it has been noticed that during the flowering time small bees, specially Apis dorsata, visit the spikes in large numbers. These bees are very busy in the morning at about 8 A. M., and in the evening at about 5 P. M., in collecting pollen and thus help considerably in cross pollination.

Conclusion, In Bajra, the flowers are hermaphrodite but the stigmas and anthers in the spikelet come to maturity at different periods. The stigmas attain their full development long before the anthers mature. The anthers attain maturity after the stigmas are nearly faded. Under these circumstances it is evident that self pollination is prevented and cross pollination is effected by wind and insects.

In order to introduce any improved strain of this crop, and to maintain its purity, in a particular area it is necessary to grow that strain alone, taking care to exclude other varieties of the same to prevent crossing.

Table No. 3

The development of the Stigmas and Anthers in the Spike of Pennisetum typhoideum.

Time of observation	Stigmas	Anthers.
	Tips of Stigmas visible	Anthers not visible.
7. 30 A. M.	Continue coming out of	,,
5. 00 P. M.	glumes.	,, ,,
7. 30 A. M.	Nearly half out	,, ,, ,,
5. 00 P. M.	Continue coming out	,, ,, ,,
7. 30 A. M.	Fully out	,, ,, ,,
5. 00 P. M.	Fading commenced at apex of spike	Tips of anthers visible
7. 30 A. M.	Fading continued	,, ,, ,,
5. 00 P. M.	Fadeding ½ of spike	Tips visible in ¾ of sipke
7. 30 A. M.	,, ,, ,,	,, ,, in whole spike
5. 00 P. M.	Faded in ¾ of spike	Few out at apex.
7. 30 A. M.	,, ,, ,,	Anthers out in nearly ¾,,
5. 00 P. M.	All faded	All out.
7. 30 A. M.	,, ,,	Faded in ½ of spike.
5. 00 P. M.	,, ,,	,, ,, ,, ,,
7. 30 A. M.	,, ,,	All faded.

(1) *In the spike the stigmas are fully out in 48 hours and take about 4 days to fade after their first appearance.*

(2) *The anthers are fully out in 36 hours and take about 3 days to fade after their first appearance.*

(3) *The interval between the maturity of stigmas and anthers is about 3½ days,*

N. B. The above statement is based on the observation of 25 spikes during two successive seasons at the College farm Nagpur.

The Cocoanut Tree

(*N. K. Pillai IV year*)

This is a perennial palm of more or less limited distribution, but of extreme importance in areas which favour its cultivation. Though the tree is not a very familiar sight to the majority of the inhabitants of this country yet some of the products like the copra and the cocoanut oil are largely used in every Indian household. Moreover the varied and innumerable uses of the many products of the plant, have given it a very prominent position in the industrial commercial, and consequently in the agricultural world. As such, it would be useful to view its cultivation and to enumerate the uses of its parts and products.

In Malabar, especially in Travancore, the situation, soil and climate are so suited to the growth of the cocoanut tree and it is cultivated on such an extensive scale that the place is known after it *Kerala* the land of Kera or cocoanut trees. It has been the greatest friend of the cultivator throngh prosperity and adversity. It has helped him out of many adverse circumstances. It has come to his relief and saved him from starvation in times of famine caused by the failure of other crops like paddy due to climate reasons and by Vismajor,—work of god. That part of the country is very much subjected to floods especially in recent years. It has been to the men of the locality a constant menace. Whatever happened, the cultivator can count on the capacity of his cocoanut garden in fetching him a continuous and regular monthly supply of money. Such being the case, it is no wonder that in Travancore the cultivator has come to look upon the cocoanut tree with something nearing reverence, and calls it Kalpa Vriksham (the Tree of Life-Desire.)

The cocoanut requires for its successful growth a more or less tropical climate, proximity to the sea, open air, plenty of sunshine, a porous sandy soil, a fair amount of marine salts and a rainfall of at least 50 inches which if evenly distributed throughout the year does not necessitate any artificial irrigation. The value of salt as a manure for this palm is very great. In addition to Malabar, which is the chief seat of the Indian cocoanut plantation and industry, other places like the Coromandal coasts, part of Mysore, the lower basin of the Ganges, Brahmaputra and Irravadi and Burma are the chief cocoanut growing areas of India.

The methods of cultivations vary according to the locality. Nuts plucked from trees of mature growth are chosen for seed purposes. They are kept for about two months and then sown in nurseries about a foot

apart in pits or trenches to which ashes and salt are added as manure and protection against insects. The seedlings are transplanted, when about nine months old, to their permanent positions in pits 3'—3'—3', 25 to 30 feet apart each way, preferably at the beginning of the rains. The subsequent treatment consists in hœing the ground around the stems and manuring with salt. Ashes, farmyard manure and fish guano are other manures to which the tree responds readily. The cocoanut plantation permits the cultivation of other plants and catch crops in the wide spaces around the trees as they are planted at great distances and as the 'Crown' is at a height from the ground. The cocoanut tree begins to bear fruit by about the fifth year and continues to bear fruits for about 80 years. They give out a spathe and a leaf every month, so that at intervals of a month they give a crop of cocoanuts The yield is at an average about 100 nuts per tree per year, but it largely varies according to the soil, climate, care expended and variety grown. But the most important advantage of this crop over others is that even if no care is given to the trees when once they are established, they will fetch to the cultivator a continuous and regular monthly supply of a fair amount of money for years.

The cocoanut tree is liable to the attacks of grubs of the Elephant beetle, Rhinocerus beetle and the red weevil which attack the root and bore through the stem and larger enemies such as rats, squirrels. flying foxes, wild cats and tree dogs which eat away the young fruits and destroy the terminal bud. Fungoid diseases like the stem bleeding disease, the bud rot and the root disease also infest the trees and cause damage. These have been investigated in recent years in Ceylon and measures for combating them successfully have been suggested.

It is doubtful whether any other tree yields such innumerable products of varied nature as the cocoanut tree Every part of the tree from top to toe is of some important and substantial use.

The use of the large stem of matured trees as timber for all purposes except for planks is peculiar to this palm. They supply good and durable pillars, fencing posts, rafters and fancy articles like spear handles and walking sticks. In Travancore, roof frames are made entirely of cocoanut timber and thatched with cocoanut leaves whose leaflets are braided into mats which gives an enviable form of thatch especially in summer. The leaf is put to many other uses also. The dry leaves make a good form of torch. The midribs of the leaflets give an effective broom. A delicate soft brown tomentum found at the base of the leaf sheath is employed as an excellent styptic. The tender yellow leaves are useful for decoration purposes. The dry leaves and leaf stalks together with the

periodical cleanings of the tree tops consisting of the dry covering of the inflorescence bring sufficient fuel for the cultivator's use. The palm is tapped for toddy which when fresh is astringent. The toddy on evoporation yields jaggery or crude suger which may be refined and the manufacture of jaggery is very important industry in may of the cocoa nut growing areas. The use of the cocoant milk or juice as a sweet-delicious and refrigerent summer drink can be appreciated only by those who have tasted it. This juice is also recomended in fever and urinary disorders. The use of the kernal or copra in cullinary purposes as a wholesome article of diet in every Indian household is too familiar to need particular mention. The use as desiccated and shredded cocoanut in European cookery and confectionary are also well known. The dry endocarp or shell of the fruit is used for preparing waterbowls of smoking pipes, ornamental vases, lamps, ladles and spoons, sugar and teapots, snuffboxes, buttons. scent bottles and the like.

Trade in cocoanut products with foreign countries consists mainly in the fibre, copra, oil and the oil cake. These products are very largely exported from the parts of Bombay, Cochin and Madras to European countries where they form the raw materials for many flourishing industries.

The fibre called coir obtained from the thick mesocarp wall of the cocoanut though only a by product, is one of the most important articles of commerce and industry. The trade of this article is in the hands of the merchants of the Madras port and the importing countries are the United Kingdom and Germany. The industry in coir extraction and coir products in the Malabar coast is rapidly progressing both in extent and importance and is a source of employment and income to a large number of the population. About 6 lbs. of coir yarn are obtained from 20 fruits. The manufactured products from it are in universal use. The strongest and most durable cordage and ropes of the world are derived from coir. Among the other products of manufactured coir are coir mattings both bleached and dyed, brooms and besoms, hassocks, hammocks, oil presses and many others. Coir articles do not suffer from damp and mats made of coir are used as sails and for other purposes of canvas. The coir dust which is the waste of coir factories is a valuable manure due to its manurial properties and especially due to its lightness and the power to keep the soil moist.

The copra contains about 50 per cent of oil. It is extracted by a hot, wet or dry cold process. The value of cocoanut oil in cooking was known only to the Malabar people till it was distributed by an enterprising firm as the much advertised 'Cocogem, the ghee substitute which is nothing but cocoanut oil subjected to an elaborate process of purification. The

long black lustrous tresses of the Indian women testify to its effectivel hair restoring properties. It is also used for lighting purposes especially in many Hindu temples. A large portion of the cocoanut oil exported to France goes for the manufacture of pomades, salves and lotions and other toilet articles. It is also largely used for the manufacture of soaps, candles cocoanut butter, margerine and many other articles like Nucoline Vegetaline and cocotine. Cocoanut butter does not easily become rancid and is preferred to dairy butter by bakers and biscuit manufacturers.

The cocoanut oil cake or '*Poonac*' as it is called is also exported in large quantities. It is one of the richest cakes. It shows on analysis the following percentage composition. Water 9·50, oil 8·43, abuminous bodies 30·40 (containing 4·/50 Nitrogen) carbohydrates 40·95 mineral matter 10·72 Its value as cattle food and manure is apparent.

Thus it is obvious that the extensive uses of these important products of this valuable palm suggest openings for various paying industries in India which still remain almost neglected aud it is a pity that instead the products are exported out of the country at nominal rates to nations who have realised their real value, to be sent back to the less enterprising India as the costly articles of the market which we do n t hesitate to purchase.

HERE AND THERE

How science may triumph over superstition—Put the results of research into the stream of common thought, so that the spirit of labor atory and the spirit of market place can be brought nearer together.

Hobbies--Occasionally one finds a man who has no hobbies. Such a man is difficult to know. It is not easy to work with him. He is very apt to be dissatisfied with life. True a hobby rider is almost as unsatisfactory a companion but there is a happy medium and the man possessed of a good hobby which he does not overwork is likely to be successful in his chosen vocation. Become familiar with the hobbies of your fellows. They can be made the basis of a more intimate acquaintanceship and many local section functions can be arranged around them. " A little nonsense now and then is relished by the wisest men", hobbies need not be nonsensical and their benifit is the more lasting.

--*Industrial and Engineering Chemistry.*

An Appeal to Past Students

(Dr. H. E. Annett, D. Sc., F. I. C., M. S. E. A. C.,)
Principal Agricultural College, Nagpur.

This article is the result of a pushing Editor. Many were the reasons and excuses I offered for not contributing an article to the current number of this Journal. Your Editor won in the end. I realise the difficulties he has to contend with in establishing a new Journal. Personally I felt some nervousness before the appearance of the first number. The two numbers which have appeared however show that we have the material and a staff who are prepared to take the trouble to produce an interesting Journal. It is up to their colleagues on the staff and to past and present students to see to it that there is no lack of support in the future. A good College Journal is always of interest to past and present students and does more than perhaps any thing else to maintain the interest of old students in their College.

I am glad to be able to record that in response to a circular letter issued by me, a large proportion of past students have promised to subscribe to the Journal. It has been suggested that we should print personal paragraphs concerning the careers of past students. In order that we may do this, past students must keep in touch with us and the Journal Authorities will endeavour to meet their wishes.

It is unfortunate but perhaps only natural that students are inclined to think of their own career and not that of the College as an Institution. This is more particularly the case with a young college. The older and more widely known a College becomes the prouder are its past students of announcing the fact that they were once its students. We want to aim at making this Institution so famous that we shall all feel proud of having been connected with it. There are many factors cancerned in the progress of an Institution such as ours. The establishment and maintenance of a good Agricultural Journal is by no means the least of these. It ought to be possible for this Journal to be made so interesting that a demand for it may arise from people interested in Agriculture who have not been at the college.

There is a great future for agricultural education in India, and I feel that our Agricultural College will make a good name for itself.

Many of our past students have now reached positions of responsibility and influence. We appeal to all old students to take a more active interest in the College and so hasten its rate of progress.

The Copper Carbonate dust method of controlling Jowar grain smut.

The Grain Smut is responsible for a considerable annual loss to the cultivators wherever this crop is grown in the Central Provinces and Berar. It may occur in epidemics some years, but more or less is present each year. The loss is caused in two ways, first a direct loss in yield; at times it may be over 20 per cent and secondly, a small percentage of smut contaminates all the grain that is thrashed along with it or stored with it, so that it has less value for seed purposes, because it is the use of infected seed that causes an incidence of this disease.

The annual loss to the cultivator has not been carefully estimated but there is no doubt that it stands at a very high figure and the poor cultivator has come to look upon this loss as a necessary evil. Fortunately jowar smut is one of those crop diseases which though common can still be very easily prevented, at a very small cost, by treating seed with fungicides.

Though the disease is generally found to some extent every year in the jowar growing parts of our Provinces, it is impossible to tell when an epidemic would occur and therefore it should be brought home to the cultivators that the treatment of jowar seed is to be considered as an " insurance policy " against smut. A small quantity, even a negligible quantity, of smutted jowar mixed with seed jowar will ensure a highly smutted crop the following season.

The cultivator has the option of two fungicides, viz. Copper sulphate and Copper carbonate. The former is a wet treatment and has been recommended in the past for many years for the control of grain smut. Though this chemical can be had in any village and though it is very cheap, still its use is not as general as it ought to be; if seed is properly pickled in a solution of this chemical the resulting crop would be completely free from smut. The pickling of seed with Copper sulphate solution has certain di advantages; frequently the seed coat is cracked during operations and even though these cracks be not visible to the naked eye they are of special significance because they permit the entrance of the solution used in pickling; though quite harmless on uninjured grain the copper sulphate solution results in considerable injury on cracked grains. The injury also is most marked when the soil conditions favour swelling of the grain with-

out causing a good shoot. Copper sulphate also delays germination under certain conditions and then gives the mould fungi in the soil opportunity to enter and complete the destruction of the grain. Again a great amount of care and accuracy is essential for getting the best results from the seed treated by this wet method; it is too much to hope that a village cultivator will treat his seed with the care and accuracy necessary for getting the desired results. For example the seed must be treated in a non-metallic vessel for a certain time in a solution of a certain strength. If the vessel used for pickling the seed be of metal or if the time allowed for steeping the seed is too little or if the solution is too strong or too weak, the fungicidal value of the chemical is lost and the germination may also be affected.

To obviate all these difficulties the cultivator must be given a fungicide which he can use without much trouble and care. Such a fungicide is Copper carbonate. This dry treatment has many distinct advantages over the wet treatment; for example—

(1) It is much more rapid than the wet method. It requires very little labour or expense to treat seed, though it is slightly more expensive than the wet method.

(2) Seed is not injured even if seed coat is cracked in threshing.

(3) There is no damage in over-treating seed.

(4) Seed can be treated any time of the year and stored without damage from injury.

(5) The germination is not affected.

(6) No extra seed per acre has to be sown.

(7) The dusted seed can be sown at any time in dry or moist soil.

The method of using copper carbonate has been described in a leaflet recently published by our Agricultural Department and copies can be had free of all costs from any Agricultural Assistant.

The most useful man.

The occasional scholar-genius who combines the borrowing qualities of the mole with the singing qualities of the lark, the man who is master alike of science, of research and of the art of expression.

Necessity for Rural Reconstruction.

(*R. A. Ramayya. IV year.*)

THE nation lives in villages. This we admit to be a wise saw—but, how many of us do realise the full import of it ? And yet a very insignificant portion of the teeming millions of this vast peninsula resides in towns. The material prosperity of India is therefore, bound up with the welfare of the villages.

There is no gainsaying the fact that we have neglected the villages ignominously and left their inhabitants to their sad fate. The villages have become insanitary and desolate ; the villages are suffering from chronic poverty. It is a happy augury, however, that the cry of rural reconstruction is in the air and the Royal Commission is interested in it. But, the commission before anything should first solve the poverty question of the Indian Peasant

The country is out for economic and social reconstruction in all parts of its complex machinery. In no part of our system assuredly is there more urgent and more crying need for new organisations than in our rural economy, in which legislation and custom have left over much chaos. Rural decadence is the outstanding feature in modern India. It is clearly seen in almost every phase of village life such as — break down of the irrigation system — degeneration of domestic animals — diminutive size of farms — decrease in the yield of farm products — decline of craft system — conjestion of homesteads — absence of schools — increase of litigations and lack of co-operation.

The most conclusive proof of the necessity of rural reconstruction is the paucity of that material, which forms the subject of so many and so frequently repeated complaints. Rural reconstruction is thus not only imparative but long over-due. If the traditions, culture, and unique civilisation of India are to be preserved intact the problem cannot be shelved any longer. Our national existence is threatened from all sides and in the interest of self-preservation we must immediately set to the rebuilding of the villages. In chalking out a line for advance in rural reconstruction the different aspects of the question must be examined from as many view points as possible.

The factors to be considered are :—

(1) Sanitary arrangements. (2) Medical relief.
(3) Congenial occupations. (4) Educational facilities.
(5) Reformed social conditions. (6) Pleasant diversions.
(7) Agricultural improvements.

Thus, the scope for rural reconstruction is open to every body be they the Lawyers, Engineers, Educationists, Doctors, Social Reformers or Agriculturists. It is a combined activity in all these spheres, whether by one or many, that can bring about general uplift of the rural masses.

An indispensable postulate for successful rural reconstruction will be found to be an appropriate organisation. " Better farming" is nothing but an outcome of sound organisation. Organisation will ameliorate the condition of the villager by ensuring to each produce a better price for his own particular lot and enable him to produce at less cost. Dwellers in the country want to have not only farms, but also "homes". Out of the vast agricultural population about 60·1 lives on insufficient food and dwells in huts so insanitary (to quote H. H. the Agakhan) " that no decent European or American farmer would have his cattle in them ". For all these things the root cause is poverty. Hence the greatest need at the present day is the bridging of poverty in the rural masses. The majority of the Indian peasants are found with all the improvidence and recklessness belonging to an irrevocable sentence of poverty for life ; and this in 1926 ! Admitting that many of the inabilities of Indian rural life are due to social and religious tradition, it cannot be denied that there is ample scope for improving the situation, by those that are educated and can work with heart and soul for the betterment of Indian rural life.

The late Dadabhoy Naoroji in his book titled "The Poverty of India" mentions how the peasantry in India, lives on course food and puts on course clothing, selling whatever they grow for satisfying the needs of other people. Is there a man, whose heart would not rend seeing his own bretheren living all their lives with insufficient meal and sometimes with no meal? Realising the gravity of the situation, it is quite essential that each person should be in touch with the condition of the Indian peasantry and help them to ameliorate their condition.

Organisation is the only remedy that might prove highly useful in bringing peace to the care-worn villagers. We want a co operative store in every village or society's cart calling there daily, to become, not the emporium of trade only, but the centre and nucleus of social and fraternal union. We want co-operation in agriculture and co-operation in domestic life. We want social, educational and character forming institutions. In rural reconstruction our motto should be—',Organise, organise, organise".

Coming to the sanitary conditions of the villages, we find that people are totally ignorant of them. Malaria has been described as a

poverty diseases and to remedy this, strong, bold and united measures are needed. The following specific measures which can be practised by the rural folk may be suggested:—

(1) *Keeping their habitation and their surroundings clean.*

(2) *Cleansing the pond and nullahas.*

(3) *Using filtered and boiled water.*

(4) *Culture of swans and ducks and certain species of fish called mannows which devour greedily mosquito larvae.*

(5) *Cultivating sanitary plants around the dwelling.*

All this short-coming and apathy amongst the villagers is due to want of education. Rural education wants to be made "*rural*" to be clad in a distinctly rurab garb, to be made to teach specifically rural things and in a rural way. And rural teachers should be rural folk, brought up in rural parts, in order to be able to pitch their folk to their pupils in a rural key.

The economic welfare of the people, is by far the most sericus factor as the welfare in all other spheres is bound up with it. Unless the lot of the villagers be improved and their economic condition bettered no hope could be entertained of their permanent welfare. Unrest breeds in this economic distress, while a well contented village is an economic asset. An even distribution of wealth is therefore urgently necessary. According to rudimentary economics the potter must support the carpenter, the goldsmith should support blacksmith and all must support spinner and weaver. The task of village reconstruction may be lightened only by increasing the *Per capita* income of the villager, as rural reconstruction will necessarily involve a great deal of expenditure.

We must therefore, lay great stress on the flow of the wealth to the villages. We must direct all our activities to the production and conservation of wealth. It must be our incumbent duty to increase our national wealth, for it is only then that the village will smile with plenty and prosperity, even as the earth is flooded with light at the rise of the sun. This can be done by producing new wealth which is possible only by reviving the cottage industries and improving them to the required technical needs; and wealth can be conserved by using nothing but swadeshi goods and by minimising waste of every kind.

What is wanted for the improvement of a village is the creation and circulation of wealth within its bounds This cannot be achieved if the chief capitalists (i. e. the land lords) restrain from doing it. In co-opera-

tion (under the co-operative Societies Act) lies the economic salvation of the rural population therein, the rich and the poor, the learned and the ignorant, the classes and the masses, in each village unit may well join hands for one-anothers' well being.

India expects every student and especially more so, a student of Agriculture whose life is for the soil of the country, to do his duty-to bring the forlorn hope to the villager and ameliorate the condition in the villages. For this task of national regeneration we want martyrs in the name of truth, real workers, and sacrificing men—men who can forego their sensuous comforts and live to renounce selfish pleasure.

The Organisation of Scientific Research throughout the British Empire.

The problem of organizing research institutions falls into two natural divisons that are intimately connected, firstly the evolution of a system of concerted action in Great Britain and secondly the linking up of activities in England with those in the Empire overseas.

The great war has illustrated three matters of vital importance. That nine-tenths of the articles and materials required by a modern army in the field closely resemble those that are essential to the maintainance of ordinary civil activities, that the manufacture of all of them are problems of applied science, and that often the interval between the laboratory and the workshop cannot be closed except by years of organized and expensive experiment on a large scale.

Organization on a national and even on an imperial basis is necessary not merely to avoid unnecessary overlap of effort, but to close the vulnerable gaps in the econonic and therefore military defence works. In this scheme of wide co-operation the main trouble has been to give the local worker freedom in research activities and yet at the same time get him to realise his obligations to the rest of the Imperial team.

All the movements in England having for their object the correlation of activities in scientific research, were, until the end of the last century purely voluntary. 'The Royal Society of London for Improving National knowledge' may be referred as a siriking instance of characteris-

tically British institution aiming to turn science to account in industries of imperial as well as national importance, maintained at the expense of its members for the benefit of the country and without the slightest financial assistance from Government.

This society which is still the recognized leader commenced its corporate life on the 15th July 1662. The society in its earliest days included papers on technical and industrial subjects as well as papers on pure science. The society of Arts was founded in 1754 to meet the growing needs of the the industrial revolution and expansion of the 18th century. It has since maintained its position as a voluntary association of those interested in turning the results of science in all its branches for the encouragement of Arts, Manufactures and Commerce.

Two movements which were originated by the society have done much to stimulate national consciousness to the the value of applied science—the Great Exhibition of 1851 and the union of so-called mechanic's institutes with its accompanying system of uniform Examinations. The other enterprize was 'The Government School of mines and of Science applied to Arts' which sprang almost directly as a result of Great Exhibition of 1851. Out of these two special enterprises there thus arose the movement towards scientific and technical education leading to research.

The Imperial Institute, The national Physical Laboratory, The Imperial College of Science and Technology are examples of the sporadic efforts which show that British Government, even before the war considered it necessary to develop national institutions for scientific research. War, however showed that—England was unable to manufacture many essential munitions due to the neglect of applied science in peace time, that isolated instances of private enterprize must necessarily leave many gaps of vital importance in the programme of scientific work, that some system of wider co-ordination was necessary to give effect to any political measures of a fiscal nature required to make the Empire relatively self. contained.

Ideas developed quickly and in June 1915 the Department of Scientific and Industrial Research was established. It gave science in its application to Industry precedence over pure science in its deliberations. As a result what was before an amorphous mob of scientific workers is now approaching the form of an organized army, without inhibiting that freedom and individuality which is essential to every research worker. The department does not attempt to do itself what can quite well be done in Colleges, Universities and other institutions. The progress of research however, is limited by various difficulties. Only a fraction of those who get a scientific education are suitable and even these cannot be absorbed readily by firms.

The foundation of the institution was quickly followed by a suggestion that the scheme be extended and made applicable to the Dominions and the Empire. Central authorities of similar nature were established promptly in the Dominions and India. It was also decided to set up specialised Bureaux by Imperial cooperation for various subjects as agriculture, statistics—mycology and minerals. The British Government have attempted recently to contemplate this frame work by appointing a committee of Civil Research. It will be an Advisory Body with no administrative and executive functions. Presided over by the Prime Minister, it will be charged with the duty of giving connected forethought from a Central Imperial standpoint to the development of economic, scientific, statistical research in relation to civil policy and administration. It will also indicate new areas in which enquiry might profitably be undertaken. The committee may consist of specialists both private and official and will not be constant in composition.

Imperial Bureaux.

Entomology—Among the special branches of science of economic value to an empire with large possessions within and near the tropical belt entomology should rank first in importance. It is only because of their want of information about the devastation caused by insects that those responsible for the administration of agricultural and horticultural countries limit their expenditure on entomological services. American figures show that the cost of employing entomologists is negligible when compared with the losses that might be avoided. The losses due to cotton boll weevil in America and Egypt, blood sucking insect in Africa. Mosquitto in India are enormous. On the other hand insects carefully cultivated may be of immense economic value. We speak loosely of the tset fly and the mosquito but there are dozens of distinct species included under these vague names. The work of identification alone in entomology has become so voluminous that several specialists are now necessary. If the damage done to cultivated crops, forests, wild plants of value, all animals and men by insect scourge is taken into consideration, the cost of research operations would be negligible. Imperial Bureau of Entomology examined about 50,000 insects annually and distributed 27300 identified specimens of insects between 1920-25. In this direction there is room for expansion

Mycology—The buraeau of mycology is financed by contributions from the Dominions, Colonies and Protectorates. The work consists in identifying fungi and diseases referred by workers in overseas parts of the Empire in addition to the dissemination of information through its Monthly Review. Thus its chief work has been that of clearing house of information for the benefit of oversea workers—official and others. The more enlightened association as the India Tea Association, Rubber grower's Association, know is practical worth.

Minerals—Growing in 1919 its functions were collecting statistics of mineral production, exports and imports for the empire and foreign countries, accumulating information as to the occurrences of minerals and the uses to which they could be put, disseminating this information to all who would profit by it, publish details of the mining laws in force in different parts of the Empire and promote cooperation between firms interested in mining and between them and research workers.

Trade Research Institutes

These are supported by firms engaged on certain technical industries. Here specially there has been a tendency for competeting firms to guard from the public and from one another, through shyness or the supposed commercial advantages of their special methods, the intimate and domestic details of their operations. Some detached and disinterested precipitant was required to bring competitors into active co operation and the institution was taken by the Departmnts of Scientfic and Industrial Research.

Empire Cotton Growing Corporation.

It is imperial in nature and has unusual powers in its relation to the manufacturing industry The corporation received its charter in 1920 and derives its income from the Government and partly from a levy of six pence per standard bale of cotton purchased by local spinners. It is in touch with agricultural se rvice in India, Dominion and Colonies, it finances, research in various centres is developing a scheme of training posts graduate students to recruit its oversea staff and has established Research station at Trinidad.

The Central Cotton Committee of India with a large assured income is planning research work in agriculture and in manufacturing problems.

After the institution of the Department of scientific and industri l Research in England corresponding organizations were set up in the Dominion and India With the close of the war various organizations made change to suit the special condition of each country. Canada proposes to build a spe ial institute for the Dominion. The most useful service that a general institute of that sort can perform is to pass on problems to specialist and put the enquirer and the scientific worker into direct touch and to become clearing house of information.

In India the policy of provincialising Industrial reseasch of all sorts has been adopted without descriminaiion. To reap fruitful results India should know that no modern country can face the commercial competition of peace time or defend itself in war by merely repeating maxims of political theory. The country is being duped with fiscal protection

instead of being prepared by industrial training to develop its own national resources in a healthy way. If the present course is followed, India will become still more dependent on outside sources for manufactured articles. It may even be required to go outside for food as it is already doing for Sugar. Natural Indigo is another instance how natural products may be displaced. What science has done in Europe it should be able to do still better in a country with natural climatic advantages but not by processes which are translated unmodified from other countries. Recent movements in Inda have been in opposite direction and result must be a loss of natural economic advantages.

England has thus laid substantial foundations in the Department of scientific and Industrial Research and has made plans for Imperial superstructure There is yet much to be done by way of building and still more by way of furnishing, all of which require money and building materials in the form of research workers which the universities should be able to supply.

—adapted from Agricultural Journal of India

Prospects of Dairy Industry in C. P. and Berar.

(*R. B. Ekbote. III year.*)

" Who ever evolves an improved strain of milch cattle which will per unit of food consumed yield twice as much milk as their progenitors, deserves better of his country than the whole tribe of politicians put together."

In this province which occupies the heart of India and feeds a fair number of cattle, dairy-industry conducted on scientific and economic lines is almost wanting. There exist only three typical dairies, the one at Jubbulpore run by the Military Department, the two at Nagpur of which one is a College Dairy and the other an ideal cooperative concern. Viz. Telankheri Dairy. It is needless to mention here the manifold merits and advantages, that the dairy cow possesses. Mr. W. H. Harrison points out that " Prosperity of a nation has a direct relation to the dairy cow" Milk as is universally known, forms the principle and the indispensable diet especially of the infants who represent the succeeding generation and will be called upon to shoulder the future weight of the weal and woe of our nation,

Of the many impediments that tend to shake and smash the foundations of dairy industry and prevent it from becoming a paying concern, lack of green and nutritious fodder to feed the dairy stock, absence of a good milch breed, want of trained men to run the business properly and profitably, the proverbial dishonesty of the professional milk men viz. Gaolies and above all the apathy of our people towards industrial concerns, are the chief.

In these parts conditions as regards ample and succulent fodder supply are disappointing. In the Chattisgarh division which mostly constitutes the rice tract the principle fodder is rice straw a very poor and less nutritious fodder. We find large stretches of poor laterite soils constituting the grazing grounds where only "Sukla or spear grass", a very coarse kind of fodder grows. In the wheat tract intensive areas overrun with kans, which in the real sense is not a fodder at all, are to be seen. The draught animals are too weak to plough those areas of fertile soils where juar and bajra which yield a fair nutritious fodder, can otherwise be cultivated. Our cattle in these two tracts are half-fed and what little they get is but coarse fodder. It is therefore no wonder that the animals are unfit for cultivating the soil. It is very recently that the cattle owners in these tracts have begun to realize the value of nutritious fodder and the economics of fodder storage. In the cotton tract however, the conditions are not disappointing. Every cultivator grows juar which yields grain and the stalk and leaves of the plant make up a good succulent fodder. The cattle owner is always keen on storing his *karbi* and understands the value of better feed. In addition, he feeds to his milch-animals a certain amount of concentrates comprising chuni, cotton-cake, til cake, bhusa etc. Naturally we find fairly developed animals especially the draught ones which have a constant demand.

The need of our province and our people lies not in the greater quantity, but better quality of the stock. The statistics of 1921–22 shows that our Province feeds 2,453,244 cows 596,589 buffaloes, which proves the sufficiency of the animals. But there is hardly any breed worth the mention. The one eminent breed viz. Gaolao a fairly pure type yields from 2½ to 3 seers of milk daily and so is comparitively a low yielder as compared with other Indian milk breeds. Buffaloes however are a bit better lot. There are to be found three distinct types viz, the Nagpuri, the Nimari and the Saugari. The former yields from 6 to 7 seers, the second 4 to 5 seers and the last 3 to 4 seers of milk per day. But again, compared with other Indian buffaloe breeds, it is distincly an inferior type.

Gaolies, who are the chief vocational men, are the source of our milk supply especially in the Urban areas. These people are the embodiments of ignorance and dishonesty. Instead of purchasing a better stock and giving superior feeds, to increase the milk yield, he often adulterates

his milk and gets easily 3 seers out of two. Fraud is his fast friend. The milk that we get naturaly is inferior, insanitary and dear at the same time. The writer has so often been required to purchase mere chalk-water. How far can such quality of diet nourish and develope the youths of our next generation ? There is the health officer's report to answer. We lost for every 1000, 27·27 of our infants last year. Can we still connive at this state of affairs ?

Want of realization regarding proper education on the part our brethren forms another barrier. Whatever number that goes in for higher education, majority walks blindly straight for the University honours. The result is that our land at present suffers from lack of trained people to overhaul the existing situation and set things right. Many of our people who by the stroke of fortune are born with silver spoon in their mouths and therefore can do much to better our condition are unfortunately submerged in selfishness and disregard for their fellow brothers. I cannot emphasise more forcibly the apathy of our people towards the industry.

Before considering the possibilities of dairy industry in this province, a few words by way of suggestion towards improvements of our existing state of affairs will not be out of place. It must be repeated that our need is for better cattle and not more ones. The improvement of our local stock is the burning question which can be solved by betterbreeding and feeding. The Agricutural Department of Central Provinces and Berar has taken the question seriously in hand and has been successful in getting better cattle. It has opened cattle breeding farms inseveral places and in addition breeding work is carried on at the College and Telankheri Dairy. Ayrshire and Montgammery milch breeds have undergone trials and the latter is found most adaptable and successful. The cross satisfies both the pail and yoke. So also the Department paid a fair attention to the buffalo-breeding and have secured good crosses from Delhi Buffaloe-Breed. The Department has thus opened a vast vista for the cattle breeders of this province to get their animal bred and improved.

Equally is the improvement of our fodder an urgent need. In the wheat tracts good fodder crops like juar and Bajra can be successfully grown on the fertile soil now under kans. Wherever irrigation facilities are existing in this and other tracts, introduction of new fodder crops like Lucerne and clover which yield a luceous aud nutritious fodder, be made. In the cotten tract our progress in this respect is handicapped due to lack of irrigation. Here storing green fodder in silos about which considerable experience has been gained at the college farm, will

solve the demand. The department has studied the natural grasses of this province and the process of hay making and now three to four hundred acres of grass are cut every year at the Telinkheri farm. People must follow this example and by its application, much of our demand for good fodder will be answered.

It will thus be seen that much can be done in the way of improvement of our local animals and fodder supply. The last but not the least important is the necessity of the sympathy of our people.

Turning over to the possibilities of the dairy industry, it must be told at the very outset that the business involves a certain amount of capital. But the idea that it requires very large sums is erroneous. In the first place let us understand that a dairy we think of opening should not slavishly imitate the model of Government dairies with up to date plants and large stock. We can start a dairy business with say 20 cows and 15 buffaloes with necessary accomodation for cattle shed milking shed and a small dairy room, with the required equipments. Of course big concerns can be started by some of our individuals from the wealthy class of this province. We do not want every body to run such concerns on large scale. But instead of one individual taking the whole burden of the business of such large magnitude, a co-operative concern will be more easy and effective. If, say, five well-to-do men come forward with the necessary amount of capital, the concern will be readily opened and easily managed. Co-operation again can be secured through the Municipal bodies. Calcutta municipal dairy is a successful model concern and if local bodies pay an equal amount of attention to this subject as is given to the water supply, sanitation, and public health every city or town can have a well managed dairy. Such concerns will to a great extent remove the present needs and answer our urgent requirements. Co-operative Telankheri dairy affords the best example of getting good out of evil. Here the Gaolies keep their milk stock in sheds along with the Government animals. The food stuffs are supplied to their cattle by the Department at a fixed rate. Government also provides good bulls to serve their animals. The Nagpur Central branch has supplied the society of the Gaolies with the necessary capital for purchasing animals and improving their stock.

Now they sell the milk under the supervision of Agricultural Department. This system of co-operative dairing proves success ful but requires close and strict supervision. If dairy industry is to be extended we can make use of these Gaolies who are the professional men and as such possess a fair knowledge required for the smooth running of the business. If we organise those people by constant demonstration and enforcing legislation, much of the work can be done on the spot.

Lastly those men who may think of starting the concern must bear in mind that a fair knowledge about animal breeding and dairying is quite indispensible. Bangalore Imperial dairy Institute is a great facility for those who aspire for higher education. It is also a suitable training ground for the Municipalities can manufacture experts to run the dairy industry, profitably.

Some of our Earliest Cultivating Classes.

A conquered race that does not intermarry with its conquerors remains in isolated subjection : it is at the bottom of the social scale and remains there, since it forms no alliance that can raise it in the world. The Aryan invasion from the north forced the orthodox aborigines to move southwards and find refuge in the hills some of whom settled down in the hilly tract now called Central Provinces. These men, who took refuge in hills and jungles live in communities of their own and have none the less maintained their racial distinction and even their tribal language.

Gond is one of the chief tribes of aborigines that inhabit these parts. Within the last century and a half the aboriginal tribe of Gond has fallen from dominion to the lowest servitude. They are original inhabitants of Central Provinces, which embraces Satpura hills and the fertile valleys to the north and south of them. Gond dynasties held sway here and the country was known–is still known–in village patois as Gondwana. The race is hardy and courageous. They have built fortresses which can be compared with those of mediaeval Europe,by Their fortresses, with forest pressing on both sides, was encompassed with high walls of red sand stone well built and elaborately crenellated pierced by imposing arched gateways that are surmounted by the Gond crest an elephant and a tiger, a lively testimony to victorious struggle of the past. In the middle of the 18th century the Gonds were overwhelmed by the tide of Maratha conquest.

From a people, Gonds have sunk into a caste and the largest of Indian castes are probably tribal in origin. Effected by the influence of Hinduism the ruling Gond and their relation distinguished themselves as Raj Gond or Ruling Gond, who even to the present day hold predominence in the hills. Other tribes of these aborigins are Marias while Murias, Porjas, Botras and Koyes also have considerable population in Buster state and South Chanda District.

Among these Maria customs and habits are much appreciated by the Europeans and civilised Indians This tribe inhabits the wilder trac.s of the Ahiri Zamindari and the borders of Baster state The Marias are in their unsophisticated state a very attractive people. The villages are usually built deep in the jungle near some wide shallow stream, which offers facilities for the *Gata* cultivation and the surrounding jungle supplement the fruits of their agricultural efforts. Few villages lack the customary grove of Tari trees, the juice of which fermented or unfermented is ever acceptable to the Gond. The Marias are a little, active looking, well built set of men. Their good looks are often marred by the ravages of small-pox and a wild form of Leprosy called Gondi Rog is fairly frequently seen. Their principal charm to Europeans is the open, hearty manner and cheerful smile of good fellowship markedly different from the schooled politeness of the Hindu, which distinguishes them.

Their dress is scanty consisting of a compromise between a Langoti and a Dhoti, a slip of cloth wound tightly round the waist in rope like fold and passed between the legs with the spare end hanging down in front below the knees, often this garment diminishes to the scantiest rag. They adorn their necks with handsome strings of beads and their arms occassionally with metal and glass bangles. Their ears are pulled out of shape by the weight of numerous brass rings with which they are usually garnished and occassionally they wear pagris. A curved knife with a brass mounted handle is stuck into the waist cloth and from the shoulders dangle the ever handy axe without which a Gond seldom moves.

Maria woman wears a *lugada* of strong cloth usually white with a coloured strip in the border they wear no *choli*, no Gond woman ever does and their necks like their husbands are garnished with beads. They frequently tattoo their faces and limbs ni intricate patterns. Their breast is covered not by the strip of cloth but by the strings of beads from the neck. But when in touch with the people who are accustomed to wear *cholis* they also try to hide their breast under their *Lugda* but as soon as they pass out of such towns they throw off this inconvenience and wound the cloth round their waist.

Maize and rice are the chief constituents of their food. They boil the maize flour in water and add a little salt before taking in. They cultivate their maize field in the ordinary way but they have also a peculiar way of their own known as Gata cultivation.

The essential condition required is a small valley with gently sloping sides and watered by a stream Substantial timber dams are built across and watered by a stream, at intervals during the hot weather and are continued on either wing by embankment of earth until they almost but not quite merge into the rising sides of the valley. A series of perhaps twenty Gatas may be constructed one below the other. When rains come a large shallow basin of water is dammed up above each Gata, superfluous water being

passed on to those below it by the escape of passages left at the end of either wing or else cascading over the top of the dam.

Rice is planted in the shallow water thus held up, the irrigated area being thus above not below the dam. In spite of these savage methods of cultivation it must not be supposed that the crop obtained is of poor quality. On the contrary according to Mr. Lancaster the rice grown by Marias is of very finest discription and far superior to any kind usually met with. The other crops of importance is kodon kutki which appeals to jungle population by simplicity of its cultivation.

The chief characteristic among the Marias is their dance, which is very much appreciated by European. All gonds but especially the marias are fond of dancing It is a great amusement of the people. Night after night in the eastern tracts of Chanda District in the cool moon light nights of the hot weather the sojourner in camp is lulled to sleep by the rythmic lilt of Gondi chorus as the villagers dance round a fire in some open space near the hamlet. The favourite dance is a peculiar rippling step-forwards with foot dragged, not very graceful when done by a single individual, but looking quite different when done in unison by a great circle of dancers singing a 'Rela' 'Rela' chorus to which the staff keeps time. In some villages where the head man is an enthusiastic for the past time a trained band performs weird and wonderful step dance to the sound of drum. At a big dance the trained band occupies the inner ring round the fire while the common folk, men and maids in separate rings move round in great circles in opposite ways. Seen in the red glow of the huge log-fire, glittering on the shining beads and barbaric ornaments of the dancers, with the throb of the drums and the beat of many feet moving in unison to the wild music of the voices in chorus a maria dance is a spectacle not easily forgotton but lingers as a charasteristic scene when other datails have faded from the memory. Men and women ordinarily dance in separate circles but in the dance when the young men choose their brides they dance in couples. A few gharas of country liquours are always at hand to shake the thirst of the performers.

The martial discipline and unity of the Marias is of a remarkable type. They are a fierce as they are modest. The so called civilised world, where unity is lacking should take lesson from these now down trodden people and learn to manage their affairs better.

N. B. Pradhan 1st year certificate.

Fertility of Egypt.

(*R. J. Kalamkar B. Sc. Senior I. Ag.*)

Egypt the home the of early civilization, is essentially an agricultural country. The total Annual National Revenue of Egypt is 300 millions Egyptian pounds and out of these, the total revenue of landed property is 148 millions, 108 million Egyptian pounds being, approximately, the value of the annual crops. In ancient times, Egypt was regarded as one of the granaries of the world.

The reasons for the fertility of Egypt are not far to seek. The soil itself is formed from the volcanic and eruptive rocks which are very rich in the plant food and to it has also been added the transported material brought by the waters of the Nile. The clay contents of the soil, range from 35 to 89 per cent, more than 8 per cent of it being colloidal clay. Now, the advantage of such a high percentage of the colloidal clay lies in the fact that a large surface is offered for the action of the dissolving agents and a great absorptive power is imparted to the soil particles thus preventing the formation of the alkaline carbonates. The water of the Nile also helps to prevent the formation of alkaline carbonates by bringing in solution more of Ca and Mg than Na or K during the greater part of the year. The presence of certain salts specially of calcium influences greatly the chemical, physical and biological factors of the soil. The temperature of the water also is relatively higher.

The climate of Egypt also has great advantages of being generally fairly uniform and free from extremes showing however sufficient difference between the south and the north so as to have a variety of crops. The production of fine cotton which is special to low Egypt has been favoured in the warm season because it is not extremely hot and it has been possible to grow Bersim throughout the country in winter which is not very severe. Bersim, it may be added here, is not only a valuable forage plant but also helps a great deal in destroying the weeds, in freeing the land from salt, in establishing the fair drainage of the land and lastly in adding to the soil the essential element No 2 which is comparatively found deficient in the Egyptian soils

The prosperity of Agriculture in Egypt greatly depends upon the native labour. Here, the native labour is abundant. This may be attributed to various reasons. The rural love of the people, the extraordinary fecundity of the race, scarcity of the cultivable land, desert and the sea on

the borders have hindered emigration. Thus there is an inexhaustible supply of manual labour and there seems to be no fear of the rural populations being drawn to the towns as has recently been seen in the industrial centres of the world.

Above all Egypt has a unique geographical position. It is situated at the junction of the two seas and lies on the maritime route of the three continents. It has therefore always been the centre of the international trade. The exportation of her products is thus greatly facilitated.

To conclude, the soil, the river which waters it, the climate, the abundunce of rural manual labour and its geographical position have made Egypt one of the best agricultural countries of the world and has also increased its wealth.

——*Adapted from International Review of the Seience and Practice of Agriculture*

Some Dairy Rules.

(*U. S. Department of Agriculture.*)

The owner and his helpers—

Read current dairy literature and keep posted on new ideas.

Observe and enforce the utmost cleanlines about the cattle, their attendants, the stable, the dairy and all utensils.

A person suffering from any disease or who has been exposed to a contagious disease, must remain away from the milk.

The Stable—

Keep dairy cattle in a room or Building by themselves. It is preferable to have no cellar below and no storage left above.

Stables should be well ventilated, lighted and drained; should have tight-floors and walls and be plainly constructed.

Never use musty or dirty litter.

Allow no strong-smelling material in the stable for any length of time. Store the manure under cover outside the cow-stable, and remove it to a distance, as often as practicable.

White wash the stable, once or twice a year; use land plaster in the manure gutters daily.

Use no dry, dusty feed just previous to milking; if fodder is dusty sprinkle it before it is fed.

Clean and thoroughly air the stable before milking; if hot weather, sprinkle the floor.

Keep the stable and the dairy room in good condition, and then insist that the dairy, factory, or place where the milk goes be kept equally well.

The Cows

Have the herd examined at least twice a year by a skilled veterinarian.

Promptly remove from the herd any animal suspected of being in bad health, and reject her milk. Never add an animal to the herd until certain it is free from disease, especially tuberculosis.

Do not move cows faster than a comfortable walk while on the way to place of milking or feeding.

Never allow the cows to be excited by hard driving, abuse, loud talking, or unnecessary disturbance; do not expose them to cold or storms.

Do not change the feed suddenly.

Feed liberally, and use only fresh, palatable feed-stuffs; in no case should composed or moldy material be used.

Provide water in abundance, easy of access, and always pure; fresh but not too cold.

Salt should always be accessible.

Do not allow any strong flavoured food, like garlic, cabbage and turnips, to be eaten except immediately after milking.

Clean the entire body of the cow daily. If hair in the region of the udder is not easily kept clean it should be clipped.

Do not use the milk within twenty days before calving, not for three to five days afterwards.

Milking—

The milker should be clean in all respects; he should not use tobacco; he should wash and dry his hands just before milking.

The milker should wear a clean outer garment, used only when milking, and kept in a clean place at other times

Brush the udder and surrounding parts just before milking, and wipe them with a clean cloth or sponge.

Milk quietly, quickly, cleanly, and thoroughly. Cows do not like unnecessary noise or delay. Commence milking at exactly the same hour every morning and evening, and milk the cows in the same order.

Throw away (but not on the floor, better in the gutter) the first few streams from each teat; this milk is very watery and of little value, but it may injure the rest.

If in any milking a part of the milk is bloody, stringy or unnatural in appearance, the whole mess should be rejected.

Do not allow dogs, cats, or loafers to be around at milking time.

Milk with dry hands; never allow the hands to come in contact with the milk.

If any accident occurs by which a pail, full or partly full of Milk becomes dirty; do not try to remedy this by straining but reject all this milk and rinse the pail.

Weigh and record the milk given by each cow, and take a sample morning and night, at least once a week, for testing by the fat test.

Care of the milk—

Remove the milk of every cow at once from the stable to a clean, dry room, where the air is pure and sweet. Do not allow cans to remain in stables while they are being filled.

Strain the milk through a metal gauze and a flannel cloth or layer of cotton as soon as it is drawn.

Aerate and cool the milk as soon as strained. If an apparatus for airing and cooling is not at hand, the milk should be aired first This must be done in pure air, and it should then be cooled to 45° if the milk is for shipment, or to 60° if for home use or delivery to a factory. Never close a can containing warm milk which has not been acreted.

If cover is left off the can, a piece of cloth or mosquitto netting should be used to keep out insects.

If milk is stored, it should be held in tanks of fresh, cold water (renewed daily), in a clean, dry, cold room. Unless it is desired to remove cream, it should be stirred with a tin stirrer often enough to prevent forming a thick cream layer.

Keep the night milk under shelter; so rain cannot get into the cans. In warm weather hold it in a tank of fresh cold water.

Never mix fresh warm milk with that which has been cooled.

Do not allow the milk to freeze.

Under no circumstances should any thing be added to milk to prevent its souring. Cleanliness and cold are the only preventives needed. All milk should be in a good condition when delivered. This may make it necessary to deliver twice a day during the hottest weather.

When cans are hauled for, they should be full, and carried in a spring wagon.

In hot weather cover the cans, when moved in a wagon, with a clean wet blanket or canvas

The Utensils—

Milk-utensils for farm use should be made of metal and have all joints smoothly soldered. Never allow them to become rusty or rough inside.

Do not haul waste products back to the farm in the same cans used for delivering the milk; when this is unavoidable insist the skim-milk being kept clean.

Cans used for the return of skim-milk should be emptied and cleaned as soon as they arrive at the farm.

Clean all dairy utensils by first thoroughly rinsing them in warm water; then clean inside and outside with a brush and hot water in which a cleaning material is dissolved; then rinse and lastly sterilize by boiling water or steam. Use pure water only.

After cleaning, keep utensils inverted in pure air and sun if possible until wanted for use.

College News and Hostel Notes

Several of us are competing for the Y. M. C. A. Pingpong and chess tournament. As we go to the press we learn two of the students have come out successful.

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The 'University sports' are fast approaching and the college will have to be represented in all the items. With some practice it should be possible for us to carry off many of the prizes this year.

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At the Agricultural College, one can never work too much. There is so much to be done that there always something left to be done At the terminal examinations which are just over this year there is a keen competition for college scholarships—

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Next week the third and fourth years will be on their way to Poona to attend the Agricultural mammoth We hope the student will profit by the very splendid opportunity of this long travel which is a part of education.

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Our Hostel Reading room is growing popular and the Library is being largely used by the students. 'Welfare,' 'Chitramaya Jagat' and a local bi-weekly are this years' useful addition to our Library table. Our Agricultural Association meets more regularly now than ever before. We have already had two interesting papers read and discussed before the Association, one on 'Land Drainage' by Mr. B. R. Phatak and the other on 'The

necessity of Rural Reconstruction' by R. A. Ramayya. We expect to give for the benefit of our readers short summaries of the learned discourses in the last number of this volume.

THE GANESH FESTIVAL.

The Ganesh festival, as usual was celebrated in the residency from 11th to 17th September 1926 with pomp and grandeur befitting the occasion. The function presented through and through a social appearance with its inter communal dinner, participated by the teacher and the taught, its lecture series embracing all shades of opinion, its variety entertainments of the students, musical feats and the general 'Arti and Mantrapushpa' in chorus. The following were responsible to make the occasion a complete success.

General Secretary	...	D. V. Subbarao
Programme Secretary	...	R. A. Ramayya
Feast "	...	P. G. Aney
Reception "	...	S. N. Nafdey
Decoration "	...	K. S. Singh B. L. Verma.

On the first night Mr. J. S. Hoyland delivered a speech on the 'Basis of social Reforms' extracts from which will be found elsewhere. Second day was the day of feast with the famous Epecurian motto transcribed in front of our dishes 'Eat, Drink and Be merry.' In the evening Mr. A. V. Khare addressed us on 'The Importance ef Festivals' an interesting subject lucidly expounded. On the third night Madhorao Joshi of kirloskar Dramatic Company entertained us with his melodious music which was followed next day by the violin performance of Mr. R. S. Krishnamurti of our own staff. A variety entertainment was given by the students on students night in the shape of speeches, tricks and fun. We had the good fortune to listen also to Prof. Madan Gopal on 'Religion in students' life' and the celebrated local patriot Dr. B. S. Moonjc on 'military training. With the unique procession ceremony, the happy week came to a close.

* * * *

BASIS OF SOCIAL REFORM.

Self-sacrifice in the cause of the depressed was the key note to the success of social Reformers. Study human character and life and sympathise with its weakness and short comings.

—The duty of students lay in removing the evils that have crept into the everyday life of the rural folk and the spirit behind all such work should be a feeling filled with a sense of pity and sympathy for the backward classes.—from J. S. Hoyland's lecture.

* * * *

Military Education.

—Military training is essential to all irrespective of caste. By legislation should it be made compulsory that students between 12 and 20 who do not reach a satisfactory standard of efficiency in this branch, should not be allowed to appear for an examination. It is said our students are not fit for military life, I would say let a beginning be made without further loss of time and befor long the required efficiency would be reached.

—As a preliminary step our students should learn how to weild 'Lathi' for self-defence and for the defence of our women.

From B. S. Moonje's speech.

Old Collegians and their Doings.

Mr D. V. Bal is once again amidst us after a successful career atl Rothamstead-England. Let us hope he fulfills his promise to meet the present and past students through the columns of this Journal, by giving us an account of his stay in England.

We congratulate Mr. Kartar Singh, our machinery Demonstrator on his suceess in Boile'rs Examination.

B. V. Rahudkar is posted at Sindewahi Farm as Agricultural Overseer.

Dharaskar who was appointed as Agricultural Overseer at Chhindwara Farm is transferred to Murtizapur.

N. B. Buxy is posted at the Nagpur College Farm as Farm Overseer

Hiralal Vaishya is posted at Drug Farm as Farm Overseer.

Ramji Pande is posted at Raipur Farm as Farm Overseer.

Obituary.

We are sorry to record the death of Mr. U. B. Metre who was one of our old collegians. He passed the two year's course in 1923 and before his death he was an Agricultural Assistant at Nachangaon Farm. While at college, he was styled as Hercules, a title he won for himself by carrying the heavy turnrest plough on his shoulders from the field to the machinery shed. He leaves behind him an aged mother, and a young widow and children to mourn his loss. We deeply sympathise with the family in their bereavement.

Our Prize Competetion.

1st Prize of Re. 5 will be awarded for the best article on an Agricultural subject appearing in our January issue 1927.

2nd Prize of Rs. 3 will be awarded for the best essay on a subject of General Interest appearing in our January issue 1927.

CONDITIONS :— Competitors must be bonafide subscribers of the Agricultural College Magazine Nagpur. The article which must be original, should be written on one side of the page only and should reach the 'Treasurer' Agricultural College Magazine by 15 December, 1926. The decision of the Prize Competition Managing Committee will be final.

The Heart of a Plant.

(S. M. Ali. Senior I. Ag.)

There come moments in the life of a nation when great men appear to vindicate the intellectual bankruptcy of the nation to brighten the darkened face of their mother country. It was in such a moment that J. C. Bose was born on 30th Nov. 1850 in Vikrampur. His father, a sub-Divisional officer was a man of noble character and great public spirit. Jagadish imbibed the good traits of his noble father aud learned to look upon failure as the antecedant power which lies dormant for the subsequent dynamic expression in what we call success.

Jagadish received his early education in the typical Bengal village with its green verdure, ripening corn, stagnant pools and murmuring river, surroundings which stood in good stead in his later life. Having graduated at the University of Calcutta, possessing a fair knowledge of physics and chemistry Sir Jagadish Chandra Bose went to England for studying medicine and entered the University College London where he made his first acquaintance with biology in the course of Instructions given by Sir E. Ray Lancaster. Due to his precarious health he joined the Christ College Cambridge for Natural science. He took his B. A. in 1803 and soon D.sc was conferred on him. During his stay in England he acquired a good all-round scientific education with special knowledge of physics.

On returning to India in 1884 he was appointed professor in the Presidency College Calcutta and continued there till 1915. While adequately discharging the onerous duties of his office, Sir Jagadish carried on research as actively as circumstances permitted. Here he incidently observed that metals possess to a certain degree the irritability which had hitherto been regarded as peculiar to living protoplasm. He reached certain remarkable conclusion that irritability is not exclusively the property of living matter, that the negative variation responses to stimulation is not a sign of life. Irritability would appear to indicate a certain unstable molecular constitution

common to metals and to protoplasm, the negative electric variation to be the expression of molecular disturbance due to stimulation.

Sir Jagadish was content with love of knowledge and joy of discovery. He invented instruments named shoshungraph, Growth recorder and Balanced creseograph which can very accurately determine the rate of growth in the plant due to fertilisers, food etc. The story told by creseograph was more wonderful to a scientific mind than Aladin's wonderful lamp. But it is an irony of fate that the application of creseograph to practical agriculture has excited more interest in U. S A. than in the land of its origin.

Later on Jagadish devoted himself more to biological than to physical side in his investigation, rather to plants than to animals. He devised apparatus such as monograph, of special sensitiveness for the detection and automatic record of the less vigorous response of the movements of plants. At least four times up till now has he been deputed to deliver the message of India to western countries including America. His most recent book, The nervous mechanism of Plants (1926) brings together all the evidence scattered throughout his previous works. It says that the conduction or transmission of excitatory impulse in plants is a physiological process and is limited to a particular tissue, certain elongated tubular cells in the vascullar bundle which may justly be termed nerve in opposition to the current view that the process is purely mechanical. In the plant as in the nerve, conduction is affected by change of temperature, by blocking and by stimulating agent which could not have any such effect upon it were it merely mechanical.

It may be generally stated that Bose's researches have established the existence of the vascular plants, at least of a circulatory and of a nervaos system circulatiory system includes neither heart not vein, consisting entirely of strands of propulsive cells distributed throughout the plant, representing a contracting arterial system. Similarly in the nervous system there are no central organs such as brain, spinal chord or even ganglia, only nerves, of which some have been shown to be sensory and others to be motor.

At his retirement in 1915 the Secretary of state granted Dr. Bose a recurring grant of Rs. 30,000 a year and 25,000 for equipment for continuation of his original scientific work. He received further, the 'knighthood' on 1st Jan. 1917. Relieved of the trammels of service, he felt the necessity of establishing a study where students would watch the panorma of life where the synthetical intellectual methods of the East would co-operate with Analytical method of the West to make a unique contribution to the store of world's knowledge. The Research Institute inaugurated in 1917, has been in active operation ever since. It is a beautiful and commodius building standing on its own spacious grounds with all the

details of its construction and arrangements carefully thought out to ensure its perfect adaptation to its purposes. There is a large auditorium capable of accomodating 1500 persons, a library and laboratories for work of various kinds. The carefully selected scholars are admitted on the condition that they devote wholly for the prosecution of research in order to realise the inner call to devote one's whole life to the infinite struggle to win knowledge for its own sake and to see truth face to face.

The foundation of the Institution at Calcutta and the branch at Mayapuri was due to the munificence of J. C. Bose. Princes have contributed also. The Institution has continued to expand from the beginning both materially and intellectualy It has shown what important result can be obtained by the combination of the logic and scientific method of the West with the imagination and idealism of the East.

Even now it is at the beginning of its career of ever increasing usefulness and brilliance, which ought to be assured by the principles of self abnegation upon which its constitution is based more than fulfilling the most sanguine expectation of its founder and reviving the ancien reputation of India as a home of learning.

(The Nagpur Agricultural college Annual Social Gathering 1926)

Dear Sir,

The Eighteenth Annual Social Gathering and Sports of our college will be held on Tuesday and Wednesday the 21st and 22nd of December 1926.

Your presence on the occasion is earnestly solicited.

'The good old happy college Days' is a very familiar expression.' The primary object of such functions is to remind you of your old college days by bringing together the teachers and the taught—past and present—under happy surroundings possible. Just imagine for a moment, do you not, in attending a function of this nature transport yourself to the congenial atmosphere of the good old days? Do you not at college breathe the spirit of freedom and of life free from worldly anxiety? You will agree that the goal of humanl ife is the attainment of Peace and Happiness.

This is just what we wish to demonstrate with your help pecuniary or otherwiese by inviting you among us. The call of the 'Alma mater' will surely persuade you to honor our invitation by your usual liberal contribution and presence and the present students will spare no pains in making your stay with us both pleasant and interesting.

The invitation card and detailed programme will follow in due course.

College of Agriculture
Nagpur
Dated Oct. 23rd 1926

A. B. Dutta
General Sectary.

NAGPUR.

Agricultural College Magazine

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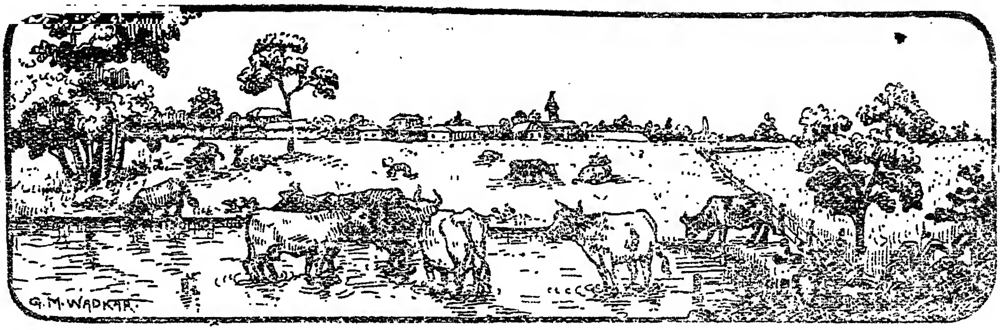

Let us hold ourselves in readiness for the fast approaching turn of fortune's wheel and let us fit ourselves to hold our own by Organization, Co-operation and Co-ordination.

Vol. 1 **January 1927** *No. 4.*

From the Editor's Pen.

Change is the order of Nature. The Old year is out and the New year is in. Winter will be succeeded by spring. One crop succeeds another. Thus, times do shift and each thing does hold its turn. New things succeed as former things grow old. Little wonder, the New year would bring changes in our magazine administration. The Magazine Committee has lost a very promising youngman in S. V. Chepe–may his soul rest in peace – a man of silent yet studious habits, a member of the College loved alike by the students and the staff.

Another of our Editors will have vacated the editorial chair by the time the next issue of the magazine is published. R. A. Ramaya it need hardly be said, has been the most popular of our boys in the College–in the class room, on the play ground, on the platform. He took more than a student's interest in the College and its activities. Behind that slim, simple stern and awry looking face lay a heart loving and truly patriotic as

seen by the undying interest he took in all that concerned his fellow students and the country. The Committee express their sorrow at losing so valuable a figure.

Another personality connected with the magazine whom we shall lose shortly is 'Doctor Annett, the Sportsman' who did more than anybody else to promote the interest of the Magazine. The Nagpur public not to speak of students, and his collegues will greatly miss him at the next Kelkar Football Cup Tournament. We wish him all good time in his new field of activity amidst more congenial surroundings.

The beginning of the new year is the fittest time to make new resolutions. The record of our activities is not what it ought to be –specially at the University Tournaments and the Inter Collegiate Debate. The Happy New year should breathe new spirit in sports. Dr. Raman the famous Physicist struck the right chord when he said that the sports manufacture a real man and they at the English universities turn out solid men –men capable of governing Empires and fighting the battle of life. We suggest the introduction of Inter year competetion in Hockey, Cricket Tennis and Football. Could we also hold one day competetion every month, in other sports.

New fields of enterprize are being thrown open to us every day. We have now the University Union, the Inter Collegiate Debate, the All India Essay Competetion. Shall we not rise to the occasion and try to raise the fair name of our College? The New year should witness the rise of Literary and Debating Societies along with the old Agricultural Association. We should also take our part in solving the vital problems of our country in the cool atmosphere of the College by organizing Rural Economic Society. More co-operation, more sympathy and goodwill will improve the general tone of our College.

* * * *

We send herewith New Year's greetings to our readers and wish them a happy and prosperous Year. With the advent of the year we are sending to our readers the fourth issue of our College Magazine. With this will terminate our year's existence. The idea of starting a magazine managed by students took shape in March last. Though it was the end of the College year, we wanted to bring the magazine into existence and with the hearty co-operation of the students and the staff were enabled to do so. The first issue of the second volume will be out in July next. Hence, we have pleasure to inform our readers that the March issue will be a special one, so that our subscribers will get four issues for their due payment of the year's subscription.

December was a particularly busy month with us. There was the Social Gathering, the University Sports, the University Extension Lectures which drove home to our mind the idea that we belong to a University in the strict sense of the term.

The Eighteenth Annual Social Gathering of our College was celebrated on the 16th, 17th, and 18th of December 1926. One of the many events in a student's life which affords him great pleasure is the Annual Social Gathering. After long hours of serious study repeated for many days, he anxiously looks to that day when he throws his books aside and the oppressive weight of study being removed from his mind, he feels the same sort of satisfaction as the Americans felt when they declared their Independence. The seriousness of study gives place to the jollity of conducting sports and dramas and the whole scene is one of merry making. This year the function of ours was presided by Sir S. M. Chitanavis, ex-minister of Agriculture and President of the Local Legislative Council. Prominent among the other guests were Mr. F. J. Plymen, Mr. Wallace, Mr. Hill and Mr. S. B. Gokhale. An account of the function with the President's stirring speech is published elsewhere for the perusal of our readers.

At the University Sports of this year, this College was admitted in full. In Tennis our competitors Messrs A. S. Bakre and R. A. Ramayya qualified themselves for the finals defeating the King Edward College Amraoti. In the finals they offered a formidable front to the Law College playing out three matches. Though our competitors could not bring home any trophy, they presented an excellent show.

The opening ceremony of the New University Building was performed on the 8th of January which was followed by the University Convocation. The Vice Chancellor sent a message to the student-world that their duty lay in bringing back happiness to the poverty stricken and miserable masses in the villages. He exhorted them to go back to the villages and ameliorate the condition of the masses instead of clamouring for Government jobs. This will do a great deal to solve the problem of unemployment. We endorse the opinion expressed by the Vice chancellor. There is much to be done in the villages and we want students to realise the gravity of the situation and do what lies in their might for the upliftment of our own flesh and blood.

One of the chief necessities of successful dairy farming is an ample supply of green and succulent fodder all the year round. Dirth of green herbage is not felt during the rains when Nature is bountiful and the ground all over is shaded with green grass. A dire necessity is felt during the summer months of March, April, May and June when the ground is dry and sunburnt. Hence, for a supply of green fodder during these months, we have to resort to growing green fodder provided we have the

required scope for irrigation. With this aim in view, the College Farm has utilised the *Nala* running by its side by bunding and thus storing water for irrigation. Success in farming like other industries depends upon business enterprise and a keen eye to utilise things which Dame Nature provides us with in a crude form. Credit is to be given to the originators of the scheme by which the College Dairy will get a supply of green fodder to pass these months of necessity.

* * * *

We wish our 'Old Collegians' will keep us in touch with their transfers and other activities. We hope they will also contribute articles and make the magazine more lively and interesting.

* * * *

Indian cultivator has long been suffering from poverty, indebtedness and hunger and every effort official or non-official is directed towards the betterment of his existing conditions. One who has lived with him, talked with him and moved with him knows that no amount of theoretical demonstration or the wonderful display of products would shake his conservative ideas. He believes in his eye rather than his ear. He readily accepts things only when they are demonstrated to him practically with facts. It was with this object that His Excellency the Governor of Bombay, planned and arranged the show. For full ten days Poona was the *Benares* of the agriculturists that poured forth from far and near. Not less than one lakh of people both agriculturists or otherwise passed through the magnificient archway to what has been known as the greatest, most interesting, most impressive and above all the most practical Exhibition ever held on Indian soils. The show was divided into as many as 27 courts so very instructive that one required a full week to go through the splendid and voluminous products, literature, and information. The show, the detailed description of which is given elsewhere in these pages was in fact a wonderful display of all sided activities concerning agriculture and so full of interest that one really felt disinclined to leave the show grounds. It will not be too much to say that Poona Exhibition was the Wembly in India. We read in various papers that the show was a complete and successful accomplishment. We do not agree with such a hasty conclusion. It is too early to venture an opinion one way or the other. The success will depend on how far the cultivator has realised that improved methods of farming actually increase the yield, comfort and happiness of the rural population which we think will be indicated by their ready and practical adaptability and utilization of what they are shown and demonstrated.

Necessity for the Improvement of Cattle

(Concluded from our July issue)

J. V. Takle N. D. D. Extra Assistant Director.

One of the factors which leads to success in cattle breeding is an intimate knowledge and practical application of the laws of heredity and inheritance and the importance of using a pre potent sire The pre-potent sire means a sire which can be depended upon to get offsprings of uniform type and produce in his offspring the good qualities he himself has and for which he has been selected. Generally speaking only pure bred bulls of a fixed type can be depended upon to breed uniformly; with a cross bred animal great variation may be expected in the offspring which may revert to the type of one ofthe parents of the cross-bred sire. In India we are particularly interested in getting a bull in which work and milk production are combined. That is to say it is desirable to use a bull whose offspring when mated with the ordinary cow will in the case of female stock be better milkers than their mothers and in the case of male offspring will be first class draught animals. Such a cross-bred animal is called a *dual purpose* animal.

When once the above mentioned type of bull is introduced in the herd of cows there would certainly be an improvement in the herd in the first generation. It will acquire the desired characteristics from the bull and therefore it is said that the sire is half of the herd because a bull is capable of transmitting his characteristics to all the calves of a number of cows while a cow may exert her influence on one calf in two years or so. As the herd becomes more valuable through the acquirement of desired characters the selection of bull to continue the improvement and hold what has been gained will prove more difficult and if care is not taken to replace this bull by a new one the whole of the herd will again deteriorate. The deterioration caused by this breeding is said to be due to In and In-breeding. In short when the same bull or his progeny is used over the same herd deterioration is sure to take place and this must be avoided.

This is one of the many difficulties in the way of improving cattle where the selection of a suitable bull is limited owing to insufficient number of bulls of good quality The difficulty lies not so much in knowing the principles as in applying them. Some farmers assume that after a few crosses of pure bred sires have been made, there is no harm in selecting a handsome young male calf produced in the herd to use as a stud bull and

thus save the expense of purchasing a new one. This is indeed wrong, because the offspring got by such bull will tend to be weak or sterile. It is a mistake to mate animals which are closely related and to continue doing so. In and In-breeding is to be practised with the greatest care and can only be done with stock of first rate quality if at all ; otherwise any defects in the parents will be increased in the progeny. To avoid deterioration due to this cause it is always better and safer to invest money in the purchase of a new bull, because the effects of In and In breeding are very disastrous. It is perhaps better to explain in greater detail what is meant by In and In breeding. In and In breeding is a system of breeding, some times used in the breeding of pure bred animals, but it is a dangerous form of breeding and must be used with great care. In-breeding means the union between brother and sister or between offspring and parent in one or more generations. This form of breeding is the most difficult to carry out, because it tends to greatly intensify the characters specially weak or bad of the family in which the breeding is going on. For instance if the family has any undesirable characters such as weakness of the chest etc , these characters are intensified and made stronger in the resulting offspring. The same is true of the good characters, therefore in practising this method one should feel that he is playing with fire. It is true that in every breed this system has been used to establish a fixed type but it requires great skill for selection.

The second effect of Inbreeding is the production of small sized, weak and poor animals, especially when the rigid selection of animals is not made. The other disadvantage of this sort of breeding is the loss of vitality, vigour and the breeding power of the offsprings ; therefore the success with this system is more clearly dependent upon selection than in any other form of breeding. Ability to select necessitates not only well-trained powers of observation and good judgment but also an intimate knowledge of the individuality and ancestry of all the animals and to gain this, a definite record of each animal must be maintained. In short the purpose of selection, we may say, is to prevent the birth of undesirable individuals. By proper selection the herd can be improved quickly and maintained at a high standard.

Feeding and breeding must go hand in hand. No breeding of any kind will improve the herd permanently if feeding is not done properly. Every farmer must know how to feed his animals and what to feed. No matter how good your animals may be, if they are not properly fed, they will never develop and display the good points that their breeding warrants. In the first place by good breeding the animals inherit certain qualities and in the second place these inherited qualities must be brought out and developed and then only the improvement is attained. It is therefore

evident that each farmer should understand the principles of breeding and feeding. The Agricultural Department will be only too pleased to give him advice and assistance in this respect if he should have any difficulty.

We hope that public interest in cattle breeding will be so stimulated in the near future that private enterprise will remove the difficulty at present experienced of obtaining good cattle either for dairying or work purposes. The first step to be taken by the farmers is the improvement of their existing herd, as under existing circumstances it is impossible to get rid of the bad animals. We therefore recommend that we should improve our existing herds by the system of breeding known as Grading. By this system of breeding we mean the mating of a common or relatively unimproved herd with one that is more highly improved by the use of a pure bred bull.

This is the system which can be followed by the average farmer of moderate means or who already has a herd. An example of this system is as follows :—Say, a farmer has got a small herd consisting of several cows of mixed blood or say country cows; he should purchase a pure bred bull from the Agricultural Department or a private breeder of pure bred stock (The Department will advise him the breed best suited to his requirements) and keep it in his herd. The male calves produced by this bull should be castrated and used as draught animals. The best females produced by that bull should be selected and bred to another bull of the same breed. By following this practice for several years he can economically build up a very high class herd in which the yield of milk will be greater and he can sell his animals at a greater profit.

From an economic point of view these graded animals may be equal to pure breds in work in case of bullocks and in milk in case of cows, but they are not as valuable as pure breds for breeding purposes the effect of which has already been explained.

Breeding from bulls produced from a herd of graded animals is only to be recommended after three or four generations have been produced by the constant use of a pure bred bull on graded females. Just as breeding and feeding should go hand in hand, in the same way great care should be taken that the animals are properly housed.

Soil Fertility-

(*K. M. Simlote, I year Degree.*)

A fertile soil is one in which plants grow well. When more precise description is attempted, difficulties arise because of differences in plant requirements, the soil may be well suited for one plant but not for another. It is quite possible that every soil is fertile for some crop although the particular crop may not be saleable. The difference in plant requirements is only one of degree and not of kind. All plants require food, water, air, warmth, absence of injurious substances. All these requirements are equally important; if any one of them is unsatisfied, the soil is to that extent infertile. No matter how much plant food the soil contains, it may be infertile if its water supply is deficient or if some harmful substance is present. Nitrate of Soda is an exceedingly valuable manure in moist climates but in dry regions it is often without effect, the productiveness being limited by the deficient water supply.

The quantity of plant food in the soil depends partly on its origin and partly on the temperature, water and air supply. The mineral substances potash, phosphoric acid and Calcium Carbonate form part of the original soil. The organic matter and nitrogen compounds are mainly recent products of living organism. The water supply depends on two factors, on the behaviour of the soil to the rain that falls on it and on the underground flow of water. The first of these factors is regulated by the texture of the soil. The ideal condition for the soil is to be uniformly moist neither too wet nor too dry. The underground drift of water is only an important factor in soils situated at the foot of a long slope or in valleys which receive the underground water from the higher land in addition to their own share of rainfall. In soils of sufficiently open texture the air supply is usually good, and if the air and water supply are satisfactory, the temperature is also satisfactory. The texture of the soil thus constitutes a highly important factor in fertility. It is regulated by the proportion of sand, silt, fine silt, clay etc. Different crops require different conditions. Crops like wheat and oats may flourish on better types of soil, and others, like potatoes, turnips, barley etc. are restricted to a particular type of soil. No amount of manuring or management will secure good crops if the type of soil is not suited to the plant.

A fertile soil must contain sufficient amount of organic matter of farily soluble potassium compounds, phosphates, and Calcium Carbonate. There must be enough of the finest-clay particles, as well as certain proportions of the coarser particles. The structure of soil should be such that superfluous water is removed quickly, while a sufficient supply always remains for the plant. In order to improve the soil, it is necessary just to discover the factor or factors limiting productiveness. The factors which limit the productiveness of soil are organic matter, improvement of soil texture, improvement of water supply removal of injurious substances and liming. If this soil is deficient in organic matter, the addition of a good deal of dung, of guano and the like will not at once put matters right. Even the best ploughing and scuffling only indifferently mix it in. There remain lumps of excreta which would poison any root that touched them. The soluble part of the dung does not get properly distributed by the rain, it is held by the layer of soil nearest to it, and gets no further. Distribution is slowly effected by earth worms and other organisms perhaps by micro-organisms, but it is slow, and we know no way of hastening it. Only when the fertilizers that are added have become properly distributed and intimately mixed in the soil does it get into 'good heart' and the process is so slow that years may lapse before it is completed. A quicker way is to feed crops on the land or to leave for two or three years a seeds mixture or leguminous crop after a previous cleaning. The roots spread themselves throughout the soil uniformly than any implement could do it and give rise when the crop is ploughed in, to a mass of easily decomposed material. The proper minerals should be supplied. In some of the experiments conducted in the United States ground rock phosphate was found sufficient. Proper cultivation, green manuring, dressing of dung or of lime and if necessary drainage, are suitable methods of improving the texture. In districts where there is insufficient rainfall (2" or more) the water supply can usually only be increasd by improving the subsoil. Any pan that may have formed must be broken. Where rainfall is insufficient recourse has been had from time immemorial to irrigation. It is imperative that a proper drainage should simultaneously be laid down. The drainage system must be sufficiently deep to prevent the subsoil water rising too high.

In the absence of calcium carbonte it happend that injurious substances are formed particularly if the air supply is limited. They are often acids, and can be neutralized by addition of lime, and by improved cultivation. Liming is beneficial for a great number of soils and is usually the first step in improving the land. It improves texture, removes acids or other injurious materials, facilitates the production

of plant food by bacteria, displaces potassium from some of the zeolitic-like Combinations, and is useful in other ways. In the United States it is often said with truth " a lime country is a rich country. " To some extent dressings of basic slag have supplied the necessary lime.

Tobacco.

—— :o:——

(*R. B. Ekbote. III year*)

Tobacco forms one of the many stimulants that are patronised nowadays. It is used for snuffing, chewing and largely for smoking. Indians used to chew it along with bettle leaf for a long time but since the advent of Mohammedan rule they have begun to indulge in smoking. The smoking practice has grown by leaps and bounds with increasing popularity among all classes. The demand for tobacco therefore rose so high that we import tobacco in the form of cigars and cigarettes of the value of one and half crores of Rupees annually. (actuals for 1922-23 being ~~Rs~~ 1,85,33,726 and 1923-24 being Rs/-1,56,75,913,) Tobacco therefore forms an important money paying crop. Besides the manufacturing of and cigarettes is an addition to our home-industries and thus can solve the question of the unemployment to some extent.

Tobacco has been said to be introduced in India by the Portuguese more than 300 years ago. The cultivation of the crop spread rapidly all over the country and at present it covers an area over a millian acres. Indian Tobacco as it is ordinarily grown is unsuitable for the preparation of cigars and cigarettes. It is good for Hookah. However in Madras and Bengal Tobacco that is cultivated suits the manufacture of cigars and cigarettes. This therefore shows that India affords immense possibilities for the profitable cultivation of Tobacco.

Tobacco is prepared from the leaves of various narcotic plants of the Nicotiana family belonging to the natural order Solanaceae. The leaves of these plants contain a volatile oil and an alkaloid known as Nicotine. Tobacco is largely grown in America, Cuba, France, and other countries of warm climate. In India it can be grown both as a dry and irrigated crop. There are two varieties cultivated.

(i) Nicotiana Tabacum and the second is (ii) Nicotiana Rustica. The former thrives well in the warm and moist climate and is therefore cultivated in Madras, Bombay, Bengal and Bihar. In drier regions of West India N. Rusticca a robust yellow flowered species having a short growing period predominates. Tobacco is best grown on open textured well drained soils with loam. Light soils with humus contents are best. Heavier soil produces a coarser leaf and on badly drained soils Tobacco plants suffer from water stagnation. In some rural areas Tobacco is generally grown on lands near village site because these lands are heavily manured. Such lands are known as khari lands.

An adequate amount of combined nitrogen is essential for the successful growth of the crop. This is added in the form of easily nitrifiable organic matter such as cow-dung. Tobacco grows best on lands cultivated continuously with Tobacco. There are clear observations against rotation of crops. Tobacco is very sensitive to the action of fertilizers and responds to them very readily.It requires for its good growth Potash, Nitrogen and Calcium in proper quantities. Analyses have shown that 10,000 lb of the crop remove from the soil about 80 lb of Potash, 50 lb of Nitrogen 40 lb of lime and 16 lb of Phosphoric acid. It is therefore essential and beneficial to give a complete mixture of fertilizers. Experiments have proved that the following amounts of fertilizers can adequately and profitably be applied to the crop.

(i) Sulphate of Potash.	120 lb
(ii) Superphosphate	160 lb
(iii) Ammonium Sulphate	120 lb

Besides these a basal dressing of farmyard manure has to be applied. The crop is grown from the transplanted seedlings. Seeds of tobacco are very small in size and contain less food-material for the development of seedlings which have consequently to lead an independent life. It is therefore inevitable to select only the sound and large seeds. The seeds are propogated in nursery. It is prepared by giving frequent cultivation, raised a little higher than the surrounding level. A bed of 10·×15· is generally required for the seedling sufficient for an acre. The nursery bed is to be well manured generally with one cart-load of well rotted farm yard manure. Tobacco seeds being very small have to be mixed with earth or sand for even distribution. The seeds are sown broadcast. Watering has to be done frequently till the seeds germinate and afterwards, watering is done both morning and evening. A careful thinning is required to obtain an individual development. The seedlings have to be protected from bright sun by thatching the nursery bed. A special attention must be paid to the removal of tobacco caterpillars. These are

found to attack seedlings in the early stage. Visits should be paid both morning and evening for arsenate dusting the plants which suffo-cates the insects and consequently kills them.

Before the seedlings get ready for transplantation the field must be ready. A deep cultivation with a plough followed by a number of harrowings and bakharings with an addition of 30 carts of farmyard manure is required. The seedlings when ready are planted on ridges. It is best to undertake transplantation in a cloudy weather when the heat is less and consequently less of transpiration. For rainy weather crops irrigation is not necessary. In a favourable season when the crop is taken in winter, irrigation has to be given frequently. It is desirable to press the seedling's a bit so that they strike root early.

The plants flower after a month and a half or at the most two after transplantation. Tobacco plants should never be allowed (except when they are meant for production of seeds) to form seeds Setting of seeds lessens the Nicotine content (for which the leaves are valued). Tops of the plants therefore which begin to bud should be nipped off. This topping increases the aroma in the leaves. Again buds that appear in the axils of leaves must be removed. This operation is known as " Suckering " This operation is done to direct all the plant food to the limited number of leaves which consequently develop. It is desirable to allow only 8 to 12 leaves to grow on the plants cultivated on sandy soils while in case of plants grown on heavy soil 10 to 18 leaves are permitted to remain. At the same time the bottom leaves which lie flat on the soil and get rot and worm eaten are removed. This process is called " Pruning. " It is a general practice " to prune high and top low " but not in all cases. The time of harvest of tobacco is a critical period since it influenecs the quality of leaves. It must be harvested when the leaves attain their adequate growth which is indicated by:—

(1) The formation of waxy substance on the leaf.

(2) The leaf when folded cracks.

(3) Margins and tip of the leaf begin to curl.

(4) The leaf becomes mottled with yellow spots.

Drying and curing.

" Growing tobacco " says Lock " is but half the battle. " There are various processes followed for drying and curing of tobacco, some of which are the following.

In any case the leaves are partly dried to remove partial moisture The plants or leaves are hung in a room well ventilated for some days the period depending on the degree of temperature. Care must be taken to see that the leaves do not get perfectly dried and become brittle by the heat. This operation is known as " wilting. "

The leaves are then cured. They are either cured by (1) Fermentative process (sweating process) or (2) Nonfermentative process.

Fermentative process.

A drying house with tiers of poles stretched inside it are the requisites The leaves are suspended by means of their stalks straddled across the poles. The temperature of the room is raised to 170° by means of fire. The heat is uniformly distributed by means of flues.. The temperature is kept constant for four or five days after which on a damp day the room is opened. The leaves then absorb the moisture of the atmosphere and become pliable. The leaves are then taken down, are stripped off from their stalks and are sorted as " firsts" (superior) "seconds", (less superior) and " lugs" (inferior and worthless). The leaves are then made into bundles or hands and piled on the floor. Fermentation sets in at this stage. The heaps are pulled down and remade to prevent rotting of leaves due to overheat and also to allow uniform fermentation of the leaf. In about three to five weeks the leaves assume a brown tint and he process comes to an end. The leaves then possess a certain elasticity. " They pull " says Fairholt " like kid leather. "

Non-fermentative process.

Here curing of leaves is done by the heat of the Sun. The tobacco plants are placed on a wooden platform in a well- ventilated room. The temperature should be from 64° to 75° with a certain amount of moisture in the air. If the temperature rises curing is hastened which prevents the formation of the rich yellow colour in the leaves, which is produced by slow curing. Curing in the room is done for five or six days. The plants or leaves are then transferred to another well ventilated and well lighted room. In this house by means of plenty of light and air curing is done perfectly. The leaves that then become pliable are stripped off from their stalks and are assorted into " firsts ", " seconds " and " lugs. " This sun-dried article forms choice brand of chewing tobacco.

The Changes that take place during curing.

(1) Loss of moisture in the leaf.
(2) Change in colour due to green colour being dissolved and removed.

(3) Starch in the leaf is converted to sugar and sugar also is lost with the liberation of $Co._2$
(4) Amount of Nicotine becomes less.
(5) The rich nitrogenous matter undergoes some changes.
(6) The leaf becomes alkaline in character.
(7) In the perfectly cured leaf high percentage of nitric acid is produced. And this causes the cigar to burn slowly. But in badly cured leaf there is formation of ammonia in which case the cigar burns quickly and irregularly. To correct this defect a solution of nitre is made use of.
8 In the fermentative process there takes place oxidation of tannin into a dark brown insoluble substance which determines the colour of the tobacco.
(9) In the nonfermentative process tannin remains unchanged.

These chemical changes are brought about by the activity of " Enzymes " in the presence of adequate degree of temperature and proper amount of moisture present in an atmosphere.

A detailed description of cigar and cigarette manufacture will in the writers opinion be too technical. However an out-line brief description is given below.

Cigar manufacture.

After the leaves are perfectly cured they are sent to the factories where they are first damped to make them soft. The lamina is stripped off from the stalk if not done before. The stalks can be used for preparing snuff. The stripped leaves are then graded into " wrappers " (firsts) " binders " (seconds) and the " fillers " (the lugs). The wrappers are very fine and thin leaves of a desirable colour. The binders are inferior leaves while the fillers are small leaves and broken pieces. Cigars are either prepared by hand or by machine. The hand made cigars are inferior to those made by machine. For 1000 cigars we require 25 lb of tobacco consisting of 4 lb of wrappers 9 lb of binders and 12 lb of fillers.

Cigarette manufacture.

The cured leaves are stripped off from the stalks and are damped. They are then cut fine by a cutting machine. The cut product is lightly stoved to remove excess of moisture and bring in the aroma. The cut product is then rolled in a paper. by means of machine.

In hand made cigarettes the edges are stuck down before the tobacco is filled in. Tobacco is rolled into a parchment the ends of which are then inserted into the ends of the prepared paper sheath called " Spill " The tobacco is pushed in by means of a pencil-shaped rod. The protruding tobacco is cut off with scissors.

Importance of Indian Agricultural Industry.

(*R. P. Verma. II year C.*)

A vast population of India is agricultural and rural, only 10.2 percent of the population is earning livelihood in cities and towns. The rest 88.8 percent of the population is directly or indirectly dependent for their subsistence on the produce of the fields. From the latter 88.8 per cent of the population only 72 percent of the population is directly connected with agriculture while the rest 16.8 per cent includes the village artisans, menials and functionaries who are ordinarily supported from the produce of the village fields. It has thus been estimated that nine tenth's of the rural population of India live directly or indirectly on the produce of the soil that is 270 millions of people out of total 319 millions are professional agriculturists. And consequently India has the greatest number of villages in the world. The number of villages comes to well over seven lacs and thirty thousands.

In the years 1923–24 and 1924–25 India exported abroad raw materials worth Rs. 10, 310 lacs that is 1031 millions. Out of the total materials exported 85 percent was the produce from the soil. This consisted of oil-seeds grain, hides, cotton etc. In the year 1922–23 India exported over 47 millions pounds worth raw jute manufacture in addition to 15 millions pounds worth raw jute and nearly 29 million pounds worth of grain and flour. We see then not only is agriculture the mother of industries so far as India is concerned, but it is by far her greatest and most important commercial stronghold. Taking a broad view of what falls within a survey of her agricultural activities it is said that her jute industry is unrivalled, that her cotton industry takes the fifth place in the world and she is the greatest wheat growing country of the British Empire.

Though the Indian Agricultural Industry is vast and most important, it is the most backward and primitive with regard to its equipment and methods of any industry in the world. The reason being that the people of this country feel happy on retaining the old traditions, customs and methods regarding agricultural operations and business. From time immemorial the people of India have used cow dung for fuel and sweeping the floors of their houses instead of for manuring and fertilising their fields. The result has been that the soil has been constantly robbed of its fertility and thus lost its vigour to give the same yield of crops which was got from the same land some years back. In some cases it has also been found that the fields which were under cultivation some

time back are lying as waste lands. This is attributed to the fact that the average farmer in this country lacks in education and knowledge of agricultural operations. He knows little of rotation, the system of mixed crops and of fallowing though the systems of cultivation are most carefully combined with hard labour and perseverance. Dr. J. A. Voelcker the consulting chemist to the Royal Agricultural Department England expressed his opinion in his report on the improvement of Indian Agriculture, which he sent to the Indian Government is as follows:—

"At his best the Indian Ryot or cultivator is quite as good as and in some respects superior to the average British farmer, while at his worst it can only be said that his state is brought about largely by an abence of facility for improvement which is probably unequalled in other countries and that the ryot will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else would."

Certain it is that the ryot is usually the smallest of the small farmers. He is illiterate and his methods of cultivation are of the most primitive character. His small holding is a mere patch of earth at which he is doomed to scratch for the barest subsistence. He is often the helpless victim of drought or disease of superstition and of the money-lender. In such circumstances it is impossible for him to purchase even the simplest modern implements. He has no money to buy fertiliser or machinery and has even to borrow money for purchasing seeds and replenish his meagre stock.

On the other hand the big land holders who are generally equally illiterate find it profitable to sublet their land to a number of tenants on high rents. Apart from these the owners of land recognized by law as proprietors are the Zamindars and Malguzars whose interests have in many cases filtered down to middlemen of various grades. They have little interest in and less knowledge of agriculture and even if they want to do something good, they cannot for they are not the real owners of the land of which they are the proprietors. The Malguzars cannot touch the land as long as it is held by the ryot. The ryot has the right of possession and cultivation as long as things go on smoothly with the Zamindars or Malguzars. The Malguzar or his agent has no right to do anything but to collect the rent which is usually very high when compared with the outturn and its value. It is not surprising therefore that these rent receivers specilize not in the knowledge of agriculture but are perfect in thousand devices by which the rent could be collected in various shapes. The result is that the ryot has no means of improvement and the proprietor has no inducement.

About ten years ago there were large estates in most of the countries in Europe. Most of these were managed by the owners themselves while others were worked by the tenants on high rents. Even then the peasants had gradually been increasing their interests in the land either

by getting their methods legalized by legislation or by making it an established practice. But the worker on the land was usually a small tenant cultivating the land under the control of his landlord or his agent. Towards the end of the great war a strong movement took place regarding the ownership of the land by the cultivators themselves. And it was successful first. in Russia and subsequently in other countries. Thus the system was changed and the cultivators achieved the position of the landlord. What has been the result of this change on the prosperity of these countries ? In the beginning of the change there was less cultivation, less domestic animals and general disorganization. But five years later great improvement took place. the cattle are greater in number than before the change, the cultivation has exceeded the previous standard and the area under grain crops has increased and there is a vast change in the character of the crops produced. The prices have gone down and sufficient food like oat and barley for cattle is grown. The last thing which has developed in the interests of the countries concerned has been the rise of cooperative organization, particularly for sale and purchase.

India is passing through a phase similar to that which prevailed in England about the middle of the eighteenth century. In England also the great improvements which took place in the eighteenth and nineteenth centuries not only provided the food to maintain the rapidly increasing urban population but they enabled the agricultural workers to raise their standard of living and so as to absorb the new goods which the mills turned out.

In India such an agricultural revolution is not yet in sight, the purchasing power of the rural masses is not rising rapidly. Indian industries may supply the place now occupied by the imports from abroad but the consumption of the mill-made articles is not great and unless the growth of the industries is accompanied by a corresponding growth in agricultural production there will soon come a limit beyond which industries can not grow.

With the prevalent conditions of the Ryots, India cannot dream even to stand properly in the agricultural market of the world. As long as there is no radical change in the rural economy through land adjustment, agricultural cooperation or scientific farming, the problem of development of the agricultural industry in this country will become more and more acute. Improvements are coming and are more likely to come rapidly in the near future, but it now rests on the shoulders of the Indian farmers to have whole hearted cooperation and patience in the development of their golden resources, which are everlasting. No other country is so favoured by the Creator as India in the fertility of the virgin soil, vast areas of tillagable lands and wide ranges of climate adopted to the growth of many crops.

The great wealth and luxury of the present day is due to the fact that the toil of production and manufacture has been to a large extent eliminated by the extensive use of machinery and nations are rich in proportion to the extent to which they have been able to avail themselves of such aid. In comparison to the western countries, India is still a country of manual labour; yet there has been a considerable increase in wealth, going on during the past century and it is largly due to the introduction of machinary to supplement hard labour. Railways have enormously decreased the cost of transportation and the steam engines and machinery employed in the cotton mills, jute mills, flour mills and other factories have added to the productive power of the country. Manual labour and animal power are feeble things when compared with modern machines and engine powers and the more we can replace or supplement the former by latter the more rapidly will wealth increase.

It is, therefore, necessary for the development of agricultural industry in India to encourage the use of agricultural machinary, equipment and mechanical appliances so that the cultivators may have the tendancy of adopting more productive and economic methods of husbandry. Though for want of capital and other causes it may be a long while before any great progress is made in this direction yet it is clearly the direction in which our work should tend.

In the end it must be said that Indian agriculturists can not make a great progress until and at all the condition of the cattle is improved. The bullock is the basis of all agricultural operations and the improvement of bullocks need special attention. This can be done by breeding and feeding the animals in a better way. In United States and Canada the average production from agriculture is roughly reckoned at Rs 624/- and Rs 476/- per head respectively against Rs 45/- per head in India, because agriculture is carried on without the additional income of cattle breeding. Economic reasons such as the small holdings and lack of capital have no doubt contributed to the neglect of the development of such useful pursuits but agricultural pursuits have now become a local subject and the cultivators should cooperate to adopt such pursuits in addition to farming.

Cooperative societies for productive and distributive purposes should be developed so that the peasants may be facilitated to market their produce, to purchase agricultural appliances, to buy cattle and so forth. These will go a great way in the development of the Indian agriculture which will not only improve the status of the peasants of this country but will add to the wealth and strength of the nation.

The Presidential Address.

Agricultural College Social Gathering 1926.

(*Sir S. M. Chitnavis.*)

At the outset I desire most sincerely to thank Mr. Allan for the great honour he has done me by asking me to give away the prizes, to the successful students. It is a great pleasure to me to come here to-day and to do the little in my power to further the interests of an excellent institution and to show my warm sympathy with the cause of agricultural education. The College has had a long career of usefulness, and it was never, I believe, so efficient as now. The good work that is being carried on here depends in a great measure upon the personal influence of the Principal and the Professors. In Mr. Allan the College has a most able and experienced head, who is devoted to its interests and to whom and his staff the marked success of the College is mainly due.

Almost all the institutions for agricultural education have started off with the intention of training men to become farmers; but it has been the experience in all places that most of the people who pass out of these institutions have sought service under Government. Perhaps this was inevitable under the circumstances that existed some years ago. The departments of agriculture were new and required qualified men for their work and as this work developed, more and more qualified men were wanted. Thus there was a natural tendency for agricultural graduates to enter Government service in large numbers. Even if the anticipated expansion of the agricultural departments should take place, it is hardly possible that a very large proportion of the graduates can be entertained in the department. The situation merits very careful consideration.

It has been felt by various workers in the field that something must be wrong somewhere for such a state of affairs, especially when we remember that India is essentially an agricultural country. When we see that a few of these agricultural graduates have taken to farming and made a success of it, we must brush aside the statement made by certain individuals that the men turned out by agricultural institutions are unfit to be farmers, as being born either of ignorance or prejudice. There are many reasons why young men fight shy of farming even after an agricultural training. I will not discuss here certain causes like the atmosphere in which most boys receive their elementary education, the general impression that all

education is merely aimed at Government service as its goal, or the ingrained feeling in the minds of the boys of the higher classes that manual work is demeaning. Two causes seem to be at the root of the state of affairs. The first is the general trend of the instruction given in agricultural institutions, and this has perhaps unwittingly been in the direction of turning out men specially suitable for work in the different branches of the departments of agriculture. The second is the lack of sympathy and encouragement to such of the agricultural graduates as do have a natural inclination for farming. Let me look at these facts a little more closely.

Taking the instruction imparted in agricultural institutions first, we find that so far as the theoretical portion is concerned, most of these institutions are quite well equipped for it, both in the matter of personnel and of appliances. This is so especially with regard to subjects other than agricultural. When we consider we are struck with the inappropriateness of the instruction given with the object in view viz. The training of farmers. The conditions which will bring home to the student, in a direct way, the economic side of farming, are usually absent; and when present, present only in an attenuated form. In some places and that lately, some importance is being attached to the teaching of 'Agricultural Economics'. This usually takes the form of making economic surveys of various areas and making a study of the statistics collected. While this is quite important in itself, it does not directly help the student very much in becoming a farmer. What is wanted is a close study of which might be termed 'Farm Economics'. Students must realise for themselves that farming is an occupation worth taking up, and this realisation must come not from a mere study of books and attendance at lectures, but by actual study of and close contact with farms worked on the latest methods and run as business propositions. The mistake is commonly made of attaching agricultural institutions to experimental farms, which by their very nature preclude them from being run as business farms. Under these circumstances although there is usually a sufficient amount of practical work for the students, there is naturally a tendency to lay too great a stress on 'observation' which in most cases reduces itself to watching other people doing the work. If therefore, we expect our agricultural institutions to turn out men properly equipped for becoming effecient farmers there has to be a certain re-adjustment of the methods followed at the present time. A reference might be made to what is known as 'Part time work in agriculture' envolved by the state of Masachusatts in the United states of America, of course, this scheme cannot be bodily transferred here as the conditions are so entirely different but it can be adapted to our condition and the training given in our College be made more efficient in the matter of training farmers.

Turning now to the position of those who pass out of agricultural institutions at the present time, most of the young men who join these institutions are not actively connected with farming, they have not been brought up in an agricultural atmosphere and are almost entire strangers to farming. A few, however do possess agricultural traditions, are familiar with ordinary farming methods, and usually go back to their farms, but we are not concerned with these few. The greater number joins the Colleges with the distinct idea of entering Government service in some capacity or another. Of these a goodly proportion will be prepared to take up farming but they do not do so for want of certain facilities. I understand in the Punjab an experiment on a small scale has recently been commenced under which government will lease out small farms to selected graduates. The progress of this experiment merits close examination. Provided due care be taken in the selection of these men,such farms will in due course serve as demonstrative centers and might readily have a marked influence on the agriculture of the district.A similar experiment may be tried in these provinces. Merely giving preferance to agricultural graduates in the matter of acquiring lands would not go very far. Government must have a definite scheme of scattering such people on land. Financial assistance in the shape of loans will have to be given at the start, and being loans they can all be recovered by Government in time. Details of such schemes must be largely dependent on local conditions and certain safeguards will have to be provided. The point I wish to emphasize is that while it is naturally quite out of the question to give any guarantee as to future employment of students entering the Colleges, it is eminently undesirable to permit a large number of students to pass through the course without some general idea as to what their future may be. Otherwise the problem of unemployment among the agricultural graduates is sure to become as acute as among the arts graduates. A Royal Commission is at persent investigating on the agricultural problem in India and if I may hazard an opinion, we are, I think, on the threshold of an era of agricultural development which will in course of time, place Indian agriculture on the same high place as it now is in Europe and America and which will contribute to the lasting prosperity of the rural population of India and through them of the country.

Before I conclude I am sure you would like me to offer on behalf of us all, our congratulations to the several prize-winners. I would also give a word of consolation to those less fortunate. I am sure they will not lose courage. I desire that the students of this college, after completing their course will utilize the knowledge they would gain by taking to agriculture as a profession. I wish them every sucess individually and to the great cause of the land in which they can be active and patriotic missionaries.

Tomato Culture.

The tomato land should be fall ploughed as deeply as possible. It should be disced to kill weeds and get the soil in fine condition. When setting for the early crop, it is easy to set the plants without watering if the soil is handed properly. The field should be prepared level and marked off in both directions and the plants set at the intersections. During dry seasons it is necessary to water the plants as they are transplanted which is very necessary in setting the late crop. If irrigation water is available the simplest plan is to make the rows with a plough. The plants are set at proper distance on the edge of the furrow and a small stream of irrigation water is turned into each row as it is set. Cultivation must follow in them a day or two to prevent hard crust forming around the roots. At this time the soil should be worked towards the plants thus begining the bed which should be gradually formed for each row. Another way to set plants under dry conditions is to haul a number of barrels of water into the field placing the barrels across the field at convenient intervals. As the plants are set a little water is poured about the roots from a can

In transplanting tomatoes the plants should be set as deeply as possible usually 4 or 5 inches deeper than the plants were in the plant bed. New roots develop along the stem, giving the plant a much larger and deeper root system than can be obtained when the plants are small and set shallow. Deep setting is more laborious than the customary shallow setting but it encourages the plants to develop large deep root systems which enables plants to make use of the moisture in the lower soil. Deeper ploughing than usual for tomatoes aids in securing the same result. Plants with deep roots are more assured of an even moisture supply do not require so frequent irrigation and do not suffer from the sharp fluctuation of alternately having too much and not enough water. Many troubles affecting tomato plants are connected with their shallow root system.

Irrigation.

If the plants are given a chance to develop deep root system little or no irrigation is necessary. Number and frequency of irrigation is determined by local conditions. Enough water should bo applied to keep the plants growing steadily. Over irrigation favours excessive vine

growth and sometimes causes the blossoms to drop without setting fruit. The first method is to open a furrow along each of plants so that the moisture can seep down to the roots without wetting and compacting the surface soil. Cultivation should follow promptly throwing the soil towards the plants. For each successive irrigation the furrow is made further from the plant and by mid-season a broad low bed has been formed which covered by the sprawling plants. Between the beds is the dead furrow which may be used for later irrigation allowing the water to seep down to the roots without wetting the surface on which vine and fruit are resting.

There are two periods at which water should not be applied. During the period when the first blossoms are open and during the latter part of the fruit ripening period. Irrigation at the earlier period will decrease the set of fruit and at the later period will retard the maturing of the crop.

Planting distance.

Every tomato grown under intensive culture where the plants are staked and trained to a single stem are set 15 in. by 3 feet apart this requiring about 12000 plants per acre. Early varieties where not staked and pruned are set about 3 by 4 feet requiring about 3600 plants per acre. The late crop are set from 6 by 6 feet to8 by. 8 feet apart requiring from 700 to 1200 plants per acre. The wider spacing are more economical of plants and labour than the closer plantings. It is difficult to say whether wider or close planting pays best. At any rate the rows must be wide enough to allow cultivation and irrigation and to permit easy passage for packers without trampling on the plants.

Queensland Agricultural Journal. December. 1926.

From the Hostel Window.

(*K. S. S. Singh, Junior I. Ag.*)

The early rays of the morning sun reveal an out-line of a long row of buildings with arched portico in front ranged in descending series with the terraced roofs built in various styles at successive times by the peculiar tastes of different engineers. When the session commences the first step that a student takes is to arrive at the Agricultural College early and secure a well ventilated, furnished, and if possible a double seated room; such a room is an object of envy of half a dozon of his fellows who live in crowded rooms having no passage left between two consequitive cots.

Surely a new student precipitately concludes an acute shortage of accomodation at first sight. But the conception does not last long as he finds himself quite at home amidst the affable and sincere chums devoted to one another and welded into one heart and mind by close association and mutual influence. A similar effect is not felt at a sister residency. There the students are generally of a reserved nature and are fond of shutting themselves up in single seated rooms. Quite reverse is the case here. A student hardly finds himself long plunged in thought, encircled as he is by numerous activities, the hurriedly rushing of one with towel and dhoti to secure the working pipe, the entry into the room with dripping garments of another and pouring out of an old bath room song by the third. Here we find one sitting by the table and pouring over books and there we find another dressed up Cap-a-pie for the day's work. A tramping up of shoes mingled with exhilaration through the long continuous corridors with cots of some sick students watching all this with their vacant eyes is an exciting spectacle.

As the sound dies away in the distant portico the sick student sighs for company and anon espies a fellow with a net approaching the clump with overgrown flower plants crowned up by the tufty green crest enhancing the beauty of the quadrangular yard, with bated breath, to hunt out a lurking mosquito,a catterpillar among foliages, chasing a beautiful butterfly veering every instant in its flight through the flower beds. The patient gets tired and with a few trophies of hunt he returns to his room.

The room by the time presents quite a different spectacle. The garments of the inmates lie scattered beside the cot soiled with the perspiration of the heaving persons of their masters.The mess bell rings and instantly in the mess halls great din and bustle reigns throughout. The cook with dexterous hand and ceaseless activity serves the dish

properly and with cool head inspite of impatient demand of every member for the different items. The poor Shiva, in spite of his best efforts to meet the demand of butter-milk, water and chutni sometimes gets wild. Though the living here is not of a high degree of comfort and ease yet there are not wanting literary societies and similar institutions of educational value which are an essential factor in promoting the material welfare.

The Superintendent occasionally by his off and on lectures profits us not a little. The recreation arrangements are still more efficient and the daily pratice reaches a high degree of excellence. Some of our good professors headed by Dr. Annett who always takes a keen interest grace the team by their presence. This brings the student and teachers closer together establishing better relations between the two scarcely found in other institutions.

After a good deal of evening recreation steps are directed homewards and the prominent figure of the Games Secretary stands out clear to give his impartial verdict on a disputed point. Yet some of the partisans unmindful of his seriousness harp on their old theme till the hostel portico comes in view when all the feelings melt away. All then with one heart and one mind mingle together cherishing the same fraternal feelings till when the morning sun pierces our window again.

The Manufacture of Papain from Papaws.

Owing to the ease with which Papaws can be grown in many parts of this country there would seem to be very little doubt that Papain could easily be produced. The preparation of the same is therefore described briefly in the following lines.

The collecting of juice or latex and the subsequent preparation of the powder are simple. Incisions 1/8th inch deep are made on the cutis (skin) by means of non-metallic knives and the juice is collected in the non-metallic basins—glass china porcelain or wood.

Any of the latex that co-agulates on the fruit is scraped off into the dish. The collection should be done early in the morning as the flow of the latex is more abundant at this time of the day.

It is stated that if not more than three or four incisions are made in the fruit during the collection, the fruit may again be scarified within a day or two when a fresh quantity of latex can be collected. If however seven or eight incisions are made subsequent scarifying will yield very little latex. Fruit two-thirds ripe should be milked. After scarifying the fruit ripens more quickly and although it suffers little if at all in flavour its injured appearance lowers its market value.

The latex when collected should be dried as soon as possible to prevent fermentation taking place. On a small scale this can readily be done by spreading the co-agulated mass on sheets of grass and placing it in the sun. If the latex is collected in the morning and placed in the sun by mid-day it should sufficiently dry by evening to withstand fermentation and can be completely dried the following day. On a large scale the drying is best done and even so constructed that the drying can be carried out at a temperature not higher than 40° c

The drying process continued until the substance is crisp and in such a condition that it can be reduced to a fine powder. An ordinary coffee mill can be used for grinding. When ground the powder must immediately be placed in air-tight bottles and is then ready for market.

Yield and Value.

One tree on an average will give 30 fruits which will yield one pound of juice. The yield of Papain is 16 to 18 o/o of the juice.

Papain is used medicinally fairly extensively. It has powerful protein digestive properties and is recommended by physicians in cases of chronic indigestion etc. There is also a possibility of its being used for culinary purposes as it renders meat tender and can be used in place of rennet for curding milk.

Various brokers in the United States of America state that they can sell 1 ton of Papain per month if not adulterated at 12 per lbs. However this is nominal and often Papain is worth very much more than this.

The United kingdom imports about 12 to 15 Tons of Papain annually. This comes almost entirely from Ceylon where it is produced by peasants. The present value of Ceylon Papain is 12 $ to 14 $ per lb. according to quality. The price is however abnormally high due to the scarcity of the supplies. The normal price is 7 $ to 8 $—6 d per lb.

Adapted from "Farming in South Africa."

Harold E. Annett, D.Sc., F.I.C., M.S.E.A.C.

(Agricultural Chemist to the Government of C.P.)

Harold E. Annett, D. Sc. F. I. C. M. S. E. A. C.

Agricultural Chemist to the Government of Central Provinces.

(*S. B. Karkarey*, M. A. LL. B.)

We regret the early departure of Doctor Annett from this country who combined in him the supreme qualities of a scholar and a sports man. We are sorry to lose him because the country is in need of men with strong head on strong shoulders. We have among our countrymen, people endowed with rare intellectual gifts but we need men able to distinguish themselves alike on the field of sport, battle and intellect. Such an ideal we had in Dr. Annett. In the laboratory or on the playing field he was an equally brilliant personality. His career as a scholar and as a player is equally fascinating. A few details of his career will not be out of place.

Doctor Harold E. Annett was born on September 5th 1884 at Walton -on- Thames, England. The childhood of prominent men, is apt to be petty and cloying. Any appreciation extended to the bib and the porringer is more likely to repel than attract. But in the case of Dr. Annett these details are of supreme importance.

Dr. Annett received his early education at Tiffins school Kingston -on- Thames, a science school of wide repute, well known for teaching chemistry. Having a natural bent for agriculture, he entered the South Eastern Agricultural College, Kent in October 1902, and obtained a scholarship by passing the scholarship examination at the top of the list of successful candidates. The College in those days was equipped with the most competent staff which was to figure so prominently at-home and abroad, in later years. Sir. A. D. Hall was the Principal and the chief professors in the institution were Sir E. J. Russel, C. S. Orwin, A. Howard and Mr. Plymen--all distinguished personages in their own circles of work. Dr. Annett took the honours course in the College and in 1906 he took his London B. sc., being the only student that year to obtain the degree in that subject.

In 1912 he went on study leave and studied Organic and Biological Chemistry at the University College London and also worked at Rothemstead and studied Yeast fermentation in Denmark. In 1919 his Thesis on "The effect of environmental factor on morphine production in the opium plant and the bearings of the results on the function of alkaloids in plants" obtained

for him the D. Scr. London. His career on the playing field was equally wonderful. He was at school and College the captain of the football and the Cricket teams.. He captained the College team in the London University Sports of 1906 and himself won the University 220 yds. race. He was an all round sportsman who at college won the cross country race and captured the challenge shield for winners of most events at the sports of 1905 These details unnecesary as they may appear furnish a key to his career which without them would be inexplicable.

Dr. Annett was advised to join the Indian Agricultural Service by Sir Mackenna (one of the members in the Royal Agricultural Commision) and came to Pusa as a Supernumerary Agricultural Chemist in 1907. Between the years 1908–1927 he filled various positions of trust and responsibility in Poona, at Pusa, Cawnpur, Lyallpur and Dacca. He served on more than two Agricultural Institutions in the capacity of a Principal but the greater portion of his service was spent as an Agricultural Chemist.

This country ought to be grateful to Dr. Annett for some very useful work done by him in sugarcane, datepalm sugar manufacture, silage and opium. When Turkey was drawn into the Great War against England, the supplies of Medical opium, the most useful drug failed. Indian opium with too little morphine ould not serve the purpose and Dr. Annett was specially deputed to find out the remedy which he did by a simple process and met the necessary supply. Many of his publications on opium question were issued and the work threw much light on the function of alkaloids in plants.

A man of genial disposition Dr. Annett was easily accessible to all. As an officiating Principal and professor in our College, the students always felt free with him and found him ever ready to advise and help. He was the best known English sportsman in Nagpur and his accurate football ' shoots ' will be long remembered by the sporting public. We have a number of scholars of great mental abilities but few who have a first class sports record of races and other games like Dr. Annett–a first class scholar and a first class sportsman with a true sportsman's spirit.

We want training in mind and body but at the present moment the latter need is the more important one for our province. "No young man is playing the part in the cause of Indian nationalism unless he keeps in mind the ultimate obligation to defend his own country by force of arms and the basic condition for handling a rifle, is the physical strength to do so. Our young men should look up to the life of Dr. Annett as the ideal.

Extracts from the Convocation Address.

"University must become a highly developed organization inspired with the aim of moulding and vitalising national life by its original research, its high-class instruction and its elevated intellectual atmosphere. An examination is not meant to be a mere passport for employment or entry into a lucrative profession. It must be a test of possession of a well-defined and well-recognized standard of culture.............English Science and English literature constitute the highest intellectual gift, the West has given us and we shall not be promoting our real progress if on sentimental grounds we fail to take the fullest advantage of this gift. Culture is universal. It knows no bounds. It is co-extensive with humanity itself.........The University knows no politics. Here we have only one aim, how best to advance the cause of higher education and culture.........The great problem now before the country is how to bring about that harmonious co-ordination of occupations and industries, which regulates the proportion of those who raise the raw materials to those who fashion them into manufactured articles. In the correlation and interchange of these two-fold activities lie the elixir of national growth and with it the solution of the problem of unemployment...........The average outturn of wheat in England is about 2,000 lbs. per acre, whereas our local wheat-yield is not more than 500 lbs. or about a fourth of what an English farmer is able to get out of his land and this notwithstanding the fact that we enjoy better natural advantages. What a vast preventable loss of our wealth is here. Why should not some of our graduates go back to their villages and take to agriculture after the necessary training in our admirable agricultural institutions? Many of them come from the landholding classes and they ought to find no difficulty in getting the necessary land to cultivate. Why should they all gravitate to cities, to hang about from office to office in search of employment which more often than not never comes? Why should they neglect to take advantage of their own property, leaving it in the hands of an unreceptive conservative peasantry, generally our head and ears in debt and so incapable of adopting modern improved methods? The key-note of our policy in this matter should be to train our boys in such professions and industries where employment can either be at once had or likely to be had in the near future.........In these troubled times when our motherland is passing through its baptism of fire in its struggle for a higher existence, when we have warring sects and parties. each claiming to have found the true elixir of national life, we are in need of such men, men who will rejoice at every opportunity of sacrifice inspired by a consuming love for our motherland, men with courageous heart which

will refuse to be turned back from its object by dangers and difficulties, men with deep faith in our noble destiny, composing and not fomenting unfortunate differences, racial and communal, harmonising all our activities and thereby realizing the goal of a united India marching towards its legitimate place among the nations of the world. Let me hope, we shall find such men in you. spending yourself in a service so divine."

" I know that Government service is not and should not be the only goal of a young man's ambition,.........This means training;training in mind and also in body. Mentally you have got to fit yourselves to compete successfully at the big examinations for the civil and other services for which examination are or in future may be held. Physically you have to strengthen your bodies by regular exercise and participation in all manly sports. And at the present moment I believe that the latter need is the more important one for this province. There have been, of course, geniuses of poor physique, and we all know and respect scholars who have no bodily strength at all. But such are not for the services. The services call for the average man as their back-bone. For the rough hand tumble life of the district or police or forest officer or for the doctor or engineer experience has shown that a strong body is as necessary as a strong mind. And above all I want you to remember that no young man is playing his part in the cause of Indian nationalism unless he keeps in mind the ultimate obligation to defend his own country by force of arms and that the basic condition for handling a rifle is the physical strength to do so. We are sadly backward in this province in the matter of women's education. If only it were possible to give some educational opportunities to girls as have been given to boys, the end of mass ignorance and illiteracy in this province would, I belive, be in sight. We could be certain also that the fight to save the children, just begun in this province,would be fought to a rapid and successful issue..........You can help also in the gradual removal of the ban which for centuries has rested on what are known as the depressed classes in this country..........you must not be disappointed if the progress made towards the realization of your ideals is slow. When you feel, as you will feel, that you are not moving towards your goal as fast as you had hoped, it may help you to remember that it is in the labour towards ideals rather than in their achievement that happiness is often best found. As a wise man has truly said, " to travel hopefully is a better thing than to arrive, and the true success is to labour. "

Working Wonders with Flowers and Fruits.

(*R. A. Ramayya IV year.*)

Greatness at first invites contemptuous indifference. The man of genius patiently weathers the storms, bends before its fury like a stalk of wheat, without breaking.

Luthur Burbank to-day is honoured all the world over as the most distinguished man in the line he chose. Both friends and foes admire him—the former, ascribing him to be the creator of new forms of life and the latter feeling jealous of Dame Nature who has divulged more secrets of vegetable kingdom than she has revealed to any other of her suitors. But when he first began his career, his new ideas–which now are no longer looked upon as mere theories, but are valued as scientific facts–were thought to be the ravings of a mad man who knew not real agriculture and horticulture. Thus the people at large gave a cold shoulder and thus he was far from being encouraged. But, great men have their own ways, different from those of the rest of the world. One of their peculiarities is to give a deaf ear to all criticisms and carry on their gospel with persevering zeal and enthusiasm. This is what Luthur Burbank did and brought home to the people that his visions were as true as broad day–light. You might think that he must have at once gained recognition for his worth. It was far from it. People began to rebel against him substituting attacks against his products this time.

When he announced to the world his marvellous berry which could ripen in less than 3 months and produce abundant and delicious fruits, the horticulturists began to declare him an imposter and his creation a fraud. These antagonists secured some seeds and finding in the harvest, few small and tasteless berries, began to spread the news that it was merely a fraud and deceit. People who had made plantations uprooted them all. But, persevering souls, grew it as per his instructions and found that what he had found was true to its very letter. The New York Botanical Garden made a favourable report after studying the plant. Inside of three months, Luthur Burbank was praised to the skies, and letters of congratulations began to pour forth from all parts of the world. With all these machinations and cold shouldering of his comrades, Luthur Burbank did not loose heart. He carried on his experiments with flowers and fruits and ultimately was successful in creating new flowers and fruits which but for his creative genius, never would have seen the light of day.

Before specifically mentioning Burbank's accomplishments, I want that the readers should know, as to what amount of patieace, lnbour and close analysis it requires to produce something new. "Shasta Daisy" was once a puny flower with irregular small petals of yellowish or white line. Our plant wizard was able to transform the same into a large, beautiful looking snowy white coloured flower with regular petals. The story of the evolution is interesting for the students interested in plant breeding. He went out into the fields and selected the best seed of the best specimens. These he planted in a plot by themselves. He chose seed again from the finest among the flowers he had grown. He repeated the process for years. His success being small, he resorted to cross-breeding to get blending of characters and produce the desired results. He found difficulty in getting the other parent plant with lustrous petals. After years of search, he found the desired plant in Japan. To get white. ness which he characterised in his new product, he discovered a daisy in England that was coarser than the Japanese flower, but was larger in type. The two along with American daisy, formed the basis for future experiments. First he artificially crossed the English with the American flower and got the desired union in the offspring. Next season he pollinated these new plants with the Japanese daisy. Thus he secured the desired blend of all the three plants. Next be started the work of selection. Evidently there was splitting of characters towards one parent or the other and he found a variety of flowers each different from the other. He carried on his selection choosing the one which came nearest, to his ideal. It took him eight long years to complete the experiment, and has been able at last to produce a perfect daisy.

A great lover of flowers, Luthur Burbank has done much to bring them to a high state of perfection. The works he has done with poppy calla lillies, amaryllis etc. are too numerous to mention here. In short he worked wonders by creating new flowers.

One of Burbank's earliest achievements was the production of the "Burbank Potato." The "Plant wizard's" work with the fruit has been most marvelous. The "Plumeot" is one of his chief achievements. It is a cross between the Plum and the apricot, and its birth, sacrilegious as it may sound, literally marked Luthur Burbank as a "creator" for he had succeeded in bringing into existence entirely new species, like nothing else on earth. Besides this his new productions called "Primus berry" —a cross of California dewberry with the raspberry, and new plum called "Bartlett Plum" pine apple quince etc. have in short practically revolutionised the whole fruit shipping industry of the world. He has given to the world, fruit trees so hardened that they are able to bear freezing in bud and blossom without injury to the fruit.

Probably his most beneficient creation is the spineless cactus for stock feeding. At least this was his most spectacular achievement and one which means much to the dwellers in the desert regions. Not only to them, but even in the Peninsula, prickly pear has been tested and found good as a famine fodder. But, Luthur Burbank has produced spineless cactus making the spicules within the substance of the cactus to disappear thus making it actually edible and palatable for animals. The fruit, at the same time was made edible for man. Thus the Pestiferous prickly pear has been robbed of its annoying qualities and made to help instead of hampering mankind. At Poona, I found at some places the growth of spineless cactus. If India as a whole could but profit by this discovery of Luthur Burbank's, it would mean much to the Peninsula, since the prickly pear grows everywhere here, and cannot be controlled, while food for cattle is not plentiful as it ought to be due to the increase in area of commercial crops and also an increase in the area of foodcrops to the ever increasing mass of population. Experiments carried out at different experimental stations in Bombay presidency indicate that the nutritive value of prickly pear is nearing to fodder juar. If Luthur Burbank's discovery is made use of, it will come as a boon and will solve to some extent the fodder problem of India.

Adapted from Modern Review.

Obituary.

We are sorry to pen the news of the death of Mr. S. V. Chepe who was one of the managing Committee of the College magazine. While at College, he was noted for his calm and easy going nature. He died of appendicitis during the Divali Holidays in the Mayo Hospital. He came from Bhandara and leaves behind him his parents and relatives to mourn his loss. We sympathise with the family in their bereavement.

Poona Agricultural Exhibition

(*N. B. Chincholkar junior I. Ag.*)

We reached Bhamburda in the morning by the Agriculturists (C. P. and Berar) Special Train. Outside the station-yards we were congratulated by many student voluntеers. We were not anxious about our lodging and boarding· Professor Phatak had preceded us to Poona and we were sure that we had only to go to the college residency and put up there and mix and join with our agricultural students and have the fullest advantage of the show. But it was a rude shock to us when we were told that no arrangements were possible in the college premises and that we were free to make our own arrangements. This did not please us. Well, we had to take it and made the most of it.

In the after-noon of the same day we went to the show. We had red-tickets. There was a great bustle, Motor-cars, buses, tangas, and cycles ran up and down the road. Police arrangement was efficient. The cars were easily available and the charges were very moderate. I have read the 'Times' and other papers but I was surprised to see that the management forgot to thank the Buss-owners, which did so much help to the success of the show.

We came to the main entrance· This was an imposing arch with two side ways. We got in. To our right we came to the, 'Water-court.' We saw huge boring machines, pumping plants, water lifting devices. Each machine was in charge of an efficient man who was very kind to explain to us the working of the machine. We came to the models on modern improved irrigation. I found the whole thing well done but doubted if the cultivators could understand and profit by it. Farther up the main avenue, which was profusely watered we came to, the 'Horticultural Court' to our left, jams, juices and jellies watered my mouth but nobody could help me there, nor could I myself with them. The main purpose in this court was to show to the agriculturists how best to utilize fruits. The attention of the visitor was drawn to the selection of suitable soil for seedling plant, irrigation and resting and prunning and treatment to combat popular insect pests. A special section was set aside to demonstrate the best marketing system, and yet another for showing the ways of preserving fruits.

We proceeded further and the, 'Areana' came to our sight. This was a special feature of the Show. Sports were held here everyday. We witnessed two wrestling bouts.

The 'Dairy court' fell to our right. The modern ways of milking, churning and disinfecting milk and preparing butter were shown to us. I was not in a fit position to understand all so perfectly but it greatly impressed me. I loitered there for a long time and enjoyed the busy sight of the section. We crossed the road and came in view of the, 'Flower Show court.' Varegated types and colours of flowers were blooming and smiling at the passers-by. One felt for a second while gazing at them that one was in the lovely Kashmir. But the din could not be ignored. It called us back to the Show.

We wended our way to the 'Machinery-Court'. All the time a crowd of men, women and children was at our heels, only to be scattered to the sides of the road when a thornycroft glided along full of Sugar-Cane.

My impression about the Machinery Court was that it was an advertising section for the big firms. There were Macbeth brothers, and there were Kirloskar brothers and many others.

Every sort of farm machinery was represented there. There were ploughs, there were boring machines, there were oil engines and there were many minute things which I saw and forgot. In particular I remember the Oil engine of the Kirloskar brothers. I was told that it was the first Oil engine manufactured by an Indian firm by Indian material. With best wishes and a glorious future to them we left the machinery court and came to the 'Rural health court.' Programmes and models were employed to show how flies and dirt and insanitary living undermines the health of the villagers and how with a little care they can live longer in the world and do more service to mankind.

The 'Live Stock court' drew our attention and two minutes found us there. This was my favoruite section. I like to look at the cows and bullocks and bulls and the buffaloes and the calves. Their healthy bodies please me. Their angry shake of horns tickles me. There at the show many Gujrathi, Nagari, and Sindhi types were brought. As the animals looked happy to me they represented the 'Elephants in miniature'. I compared our Chattisgurhi Live Stock with those present and I was ashamed of the comparison. There were milk cows which yielded milk in a single day which our Chattisgarhi cows would give in six months. There were bulls which are used as beasts of burden. We admired the animals in the court and learnt the various places, from where they came. This took us a very large time and by this time the syrin went off and we left the court reluctantly and returned to our lodge.

Morning found us laughing and going to the Show. This day we first went to the 'Soils and the Fertiliser' court. A series of plots were laid out and manured and some were unmanured for comparison. The luxurious growth and fine condition of the manured crops was an open

indication of the right and judicious use of modern manures, and their benefits. Many leaflets were distributed dealing with these. The visitor was much interested since he saw the effects so vividly. Nitrate of Soda attrated his attention most.

The 'clack, clack' of the hens, attracted our attention. We went to 'Poultry court' and were greeted by more, 'clack clacking' noise. Nowadays nothing pays so well as the poultry farming as a subsidiary farming. We can sell eggs and poultry. In these days of improvements eggs have found a sound and strong footing as a food of very high value. And poultry does not require a very large capital. It requires one to attend to the welfare of the hens, the cocks and the eggs. The care of the eggs is rather difficult. It wants a watchful man who understands under what temperature a certain egg should be placed so that it may not go bad.

We then passed to the 'Subsidiary Industries court.' Demonstrations were given how a farmer can employ this leisure to advantage, and benefit. Toy making, rope-making, cane-making were demonstrated. It was shown how simple it was to make ropes and strings from any straw, grass or cotton-fibre. It was also shown how the unlimited supply of khas-grass, bamboo, and palms from the forest bring within our reach the paying industries such as making of fans, baskets, trays and chairs. The interesting feature was the display of horn-work. This was really a useful 'court' which could help the farmers. They can improve their financial conditions and add to the wealth of the Nation.

We then stepped in the 'Hand weaving' court. Here it was shown by practical demonstration how the Dhoti which we wear is made. Hand looms were shown with shuttles. Women and men were busy with the looms. Both silk and cotton types were exhibited. Here we realized how much trouble our silk-shirt causes. This section had another point of interest. By improving our yarn and the methods of weaving we add to our wealth and we become self-supporting. We may look to the distant day when we shall come up to our old-standard of Dacca muslin which was a wonder to the Westerners and which they envied somuch.

We proceded to the, 'Pestscourt,' which attracted a very large number of spectators. Pests are a standing scourge to the crop. They devaste the field and make many a farmer weep and rue his day. Many kinds of living and dead birds and insects were exhibited and the havoc they caused to the crops was demostrated. It was shown how we can get rid of them with the help of Insecticides, spraying and dusting. Apparatus of these methods were also exhibited.

We went to the, 'Crops court and feasted our eyes on the bountiful crops grown by our fellow students of the Poona Agricultural College. We returned home. The show was full of interest and use.

Our Social Gathering

This year, we were lucky in having amidst us a number of old Collegians. After the morning tea there was the Tennis Final for Singles championship. In the afternoon we had the elocuation competition. In the evening was played a Hockey Match between the present and past students and it was decided in favour of the present students by 2 goals to 1. This year in the sports were included some interesting events like Relay Race and Cock-fight. In the noon, was the finals of the Indoor games viz. Chess and Ping Pong. The Foot-ball match between present students on one side, and past students and staff on the other side, ended in a draw. This year the students staged a social Drama in Marathi "*Hach Mulacha Bap.*" and it was highly successful. The stage management was good, the credit is largely due to R. N. Gadre.

Sir S. M. Chitnavis, ex-minister of Agriculture presided over the prize distribution ceremony and delivered an interesting speech. After this the party moved on to the Research Institute grounds for the At Home.

The managing committee of the Social Gathering.

1	Mr. A. B. Dutta ...	...	General Secretary.
2	Mr. D. N Das. ...	...	Sports Secretary.
	" N. B. Pradhan.	...	" "
3	" B. R. Reddy. ...	...	At home Secretary.
	" K. G. Pathak.	...	" "
4	" N. B. Pandhar.	...	Reception Secretary.
	" V. V. Joglekar.	...	" "

We give below a list of prize winners in the various events of the College Social Gathering.

In Sports.

		First	Second.
1	100 yds. race.	Mr. R. J. Kalamkar.	Mr. N. K. Ghosh.
2	440 yds. race.	" N. A. Khan.	" A. B. Dutta.
3	One mile race.	" K. N. Phadke.	" R. N. Kher.
4	Sack race.	" D. V. Mahajan.	" N. Z. Ahmed.
5	Obstacle race.	" A. B Dutta.	" R. J. Kalamker.
6	Hurdle race.	" R. J. Kalamkar.	" A. K. Chatterjee.

7	Shot-put,	Mr. N. A. Khan.	Mr. R. J. Kalamkar.
8	Cock fight.	„ W. P. Lakhkar.	
9	Long Jump.	„ A. S. Bakre.	„ N. A. Khan.
10	Bullock race.	„ N. G. Sirpurkar.	„ Upadhya.
11	Relay Race	1 year, Messrs.	N. K. Ghosh, N. A. Khan. B. R. Reddy and M. A. Rab.
		II year, Messrs.	R. J. Kalamkar, N. Z. Ahmed. A. S. Bakre. and D. N. Das.
12	Tennis Singles. runner up		Mr. S. N. Mushran.
13	Mrs. Allan's Singles Tennis championship medal.		„ R. A. Ramayya.
14	Tennis Doubles Champions.		Mr. S. N. Mushran. „ R. A. Ramayya.
15	Ping-Pong	Mr. R. A. Ramayya.	Mr. A. N. Karnik.
16	Chess.	„ M. A. Rab.	„ N. K. Pillai.
17	Gymnasium.	„ D. R. Dhodapkar.	„ G. E Talwelkar. „ K. R. Sowle.

Association Essay Prize.

Mr. S. B. Gokhale's Prizes.

First Prize.	... ...	Mr. R. A. Ramayya.
Second Prize.	... ...	„ R. B. Ekbote.
Third Prize	... ...	„ R. J. Kalamkar.

College Prizes.

Smythies Chemical Medal	...	Mr. M. Gangadhar. L. Ag.
Directors Prize for the best student of the year	...	Mr H. P. Singha L. Ag.,
Special prize for Botany	...	Mr. H. P. Singha.
„ „ Entomology	...	Mr. N. K. Das.
„ „ Agriculture	...	Mr. H. P. Singha.
Kedarnath Rai Medal for Agricultural Engineering	...	Mr. M. Gangadhar. L. Ag.
Coronation medal	...	Mr. N. K. Das.
Napier Essay prize	...	Mr. N. K. Das.

Second Year.

Class Prize	...	Mr. R. B. Ekbote.
Special prize for Section I	...	„ R. B. Ekbote.
„ „ Section II	...	„ R. S. Sapre.

„ „ Section III	...	„ R. B. Ekbote.
Judging Dairy stock II year Dip.	...	Mr. G. G. Phadke.
Chaudhari Medal for practical Agriculture	...	„ S. G. Kolte.
Special prize Certificate Course.	...	„ Dharaskar.
Judging dairy stock—II year cert.	...	Mr. D. N. Dharaskar

First year

Class prize	...	Mr. R. J. Kalamkar.
Special prize for Section I	...	„ R. J. Kalamkar.
„ „ Section II	...	„ D. N. Das.
„ „ for practical Agriculture	...	„ S. T. Patil
„ „ certificate course	...	„ Cleophas.
Phatak's prize for Agricultural Efficiency.	...	Mr. R. J. Kalamkar

General.

Messrs. R. B. Ekbote and R. A. Ramayya represented the College in the Inter Collegiate University Debate Competition. Thus the College is participating in Literary functions as well,

Mr. Ramnarayan Dubey who was in the Telankheri Dairy has been sent for Post-graduate Study in Dairying to Bangalore. We wish him success at the institute.

Mr. N. R. Pande a Past student of our College is transferred from Basim farm to Adhartal farm Jubbulpore.

Mr. K. J. Bansod has been appointed as farm Overseer at the Akola farm.

Mr. P. Y. Deshmukh our old Collegian, has returned from America. He is now devoting his life to Private farming and improving the conditions of the peasant population. True the task is great, still, we hope much will be done by the association which he has brought into existence under the title " Sons of Bharat ". We wish it a brilliant future.

Fruit drying for Amateurs and Beginners

Principle.

The common principle involved in drying fruits is to evaporate the natural moisture present in the fruit so as to check decomposition of organic substance brought about by the lower forms of organisms in presence of moisture. Drying is done either by the heat of the Sun (directly or indirectly) or fire. Some chemicals that are harmless to digestive organs are also made use of for drying fruits.

Outfit.

Trays for keeping fruits, dipping tanks and dipping baskets, a portable sulphur box or permanent house, are all that is required.

The drying trays.

Wooden trays of different shapes and sizes are used in different countries. In Australia they use trays measuring 3 ft & 2 ft. The bottom consists of three boards each 8" in width and ⅓rd " thick, tongued and grooved. The ends are 1½" to 2½" high and are made of oregan pine. The three boards are nailed on to these. These trays are light, and are easily handled by one man.

Dipping Tank or Bath.

Fruits like Plums and Grapes are dipped in these tanks (for making loose rasins) in a hot solution of lye. By the caustic action of the solution small cracks open on the surface through which moisture escapes readily. These dipped fruits then require less time for exposure and get a brighter colour. There is also less possibility of such fruits being damaged by insects. A permanent tank of 2½ ft & 1½' by 1¾' holds about 40 to 100 gallons.

Dipping Baskets.

These are either constructed from a kerosine tin or galvanised wire. The former type is both simple and cheap to prepare. The sides and bottom of a tin are holed from inside so that jagged surface is left outside. A handle ring is fixed to the punctured tin in such a way so that tin swings freely within the ring. This facilitates inversion of the tin whenever required.

A second type of basket is prepared out of galvanised wire of $\frac{1}{4}$" mesh. It is bound up with hoop iron each end carrying on the outside a stouter piece of flat iron which in turn has its end rounded and turned away at right angles. These rounded ends project $1\frac{1}{2}$" and support the handle.

Sulphur boxes.

It is made by joining a frame work of light and strong wood. The length of the box is more than the breadth. A hole or two are left in the centre of the top to allow the air to run through to assist ignition of sulphur. The box is covered with stout calico and is then coated with lime-wash.

Tray carrier or stretcher.

Trays of fruits are easily transferred from cutting bench to the sulphur box and thence to the drying ground by means of hand stretchers these consist of two strong handles braced with two or three cross pieces and having four short legs.

Drying ground.

A dry, hard smooth piece of ground away from roads and traffic and free from dust is selected for this purpose. The trays of fruits are spread on the ground leaving a space between the rows to move about.

Drying of Plums and Prunes

A variety rich in sugar and possesssing a sweet and tough skin may be dried. The fruits that are to be dried must be perfectly ripe. In some countries sheets are spread under the trees which are then gently shaked. The ripe fruits consequently drop down.

The fruits are then carried to the Dipping Tank. There they are dipped in a hot solution of Lye made by dissolving a lb of caustic soda in about 8 to 12 gallons of water. The fruits are dipped from 5 to 10 seconds accordingly to the strength of the dip but care must be taken not to dip the fruits a long time in which case they burst and the juice leaks out.

After the dipping operation they are stacked on the stretcher for an hour or two and then spread out on the ground. If the fruits are dried in a kiln on evaporation care must be taken to see that they are not subjected to a temperature more than 130° F.

The fruits are then assorted and bulked together in boxes or bags for a week or two at least. This operation in known as "Sweating". Some times they are again dipped in clean hot water to remove the dust sticking to it and dried for a few hours and stored. Most growers add glycerine 1 lbs to 20 gallons of water when putting through the cleansing dip to give glossy palatability to the skin and pack them into the packing boxes lined with damp proof paper.

Drying of Apple.

The fruits must be thoroughly matured though not ready. They are peeled and cured by one machine and sliced by another.

As soon as the apples are peeled and cored are sliced and the slices are spread out in their layers on the trays and subjected to sulphur fumes for half an hour to fix the colour. It is imperative that no delay should occur in slicing the peeled and cured product and sulphuring the same, otherwise the out surfaces become discoloured in no time. If delay is unavoidable the product is dipped in weak brine until ready for slicing. Apples are dried in evaporators where a temperature of 140 to 160 F is kept constant. The slices are then subjected to heat and draught of air from eight to ten hours. When the drying is complete the fruits are some what sticky and pliable and are put to sweat protecting the attack from moths.

Drying of plantains

The fruits before drying are firstly well ripened Then they are spread in a line on a mat spread on the drying ground. After leaving them for the whole day in the sun, they are collected and heaped in the evening. these heaps are covered with dry plantain leaves and a mat and kept in that condition for the whole night. The above processes are repeated three days and three nights. On the fourth day the fruits are ready for marketing. The plantains after drying become elastic, flattened and reduce in size. They taste sweater as they dry. It is said that dried plantains keep for six months.

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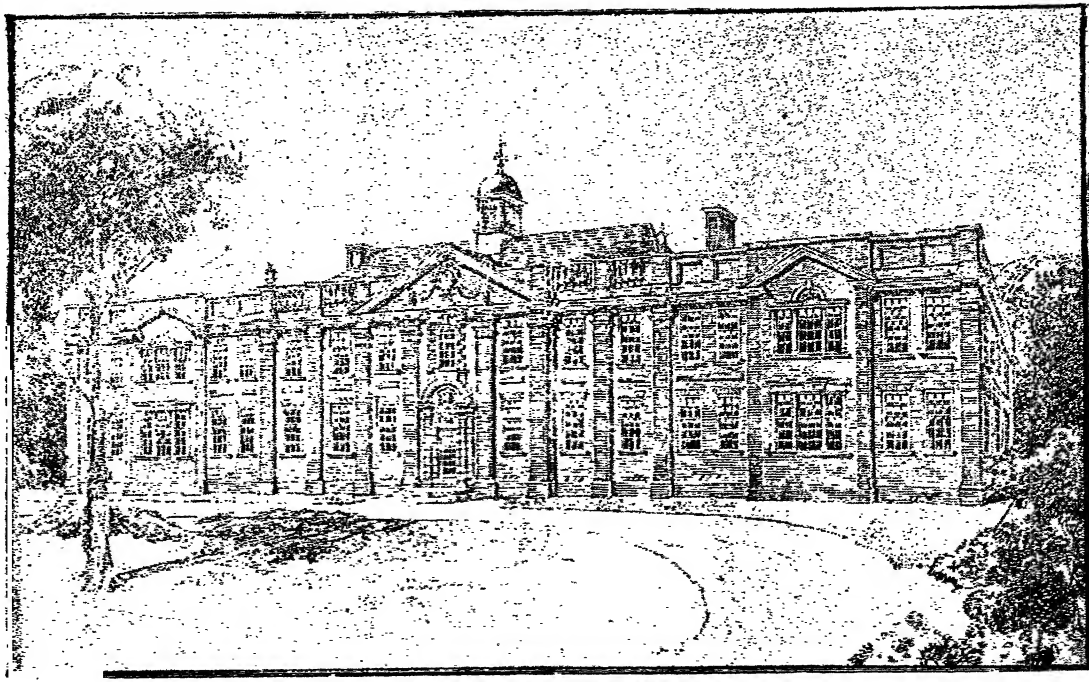

The New Rothamsted Laboratories.

Agricultural College Magazine.

Think it not thy business, this of knowing thyself; thou art an unknowable individual; know what thou canst work at; and work at it like a Hercules. — *Carlyle.*

Vol. 1 *March 1927* *No. 5.*

Editorial.

THE month of March is our busiest time. Every day is crowded with work of the most important nature. The students have their examinations, the staff are busy day in and day out with that hard job of 'invigilating' and wading through piles of answer papers. All attention is concentrated on examination. There is hardly any time left to be devoted to anything else. The Magazine business naturally falls in the back ground to be taken up seriously only when our tired nerves have had a little relaxation. We offer no apology for being late as the delay is deliberate and was designed to enable the magazine to incorporate the college examination results, such an important event in the life of an Indian student.

In presenting the last issue of this year to our readers, the Editors desire to thank all who helped the progress of this young journal. Our task has by no means been a simple one. But we have always believed that an endless significance lies in work; a man perfects himself by working and hence we have gone on with the mission with which we

started. We have been required to stand entirely on our legs even financially and those with practical experience in this line know how difficult it is to run a concern smoothly without lowering the standard once attained. For reasons which we are unable to fathom, the officers of the department have been to a large extent apathetic and consequently we have had to fall, perhaps fortunately, for a constant supply of contributions on the student world, which was in fact, our cherished ideal. True the intrinsic worth of various contributions may not have been great but beginnings, as every one knows, are small and continuations for some length of time may not be very great. Surely however we are on the right track and ere long will be able to produce a really first class magazine.

There is another point with regard to the magazine which requires special mention. Some of our kind critics have regarded this as a research bulletin to contain entirely new and at once original matter, others have regarded this as a departmental mouth piece, none of which the magazine purports to be. It has a true educational value, at least it has been instituted with that object. We think that education is not an individual but a corporate matter. The individual by himself is powerless, that he is powerless for action has long been obvious. We are now beginning to realise that he is to a large extent powerless for effective thinking also. Solitude may breed the mystic, the philosopher and even the scientist but in all those great departments of knowledge which concern the thoughts and actions of mankind, the thinker needs the stimulus and experience of his fellowmen. If we are to keep our mind alert we ought to afford all possible fascilities for communication among a group of like-minded students.

The magazine in the past has contained. some really original articles, gleanings from useful periodicals which we believe, are not within easy reach of moffussil libraries, much less of individuals. It has circulated news of the college, city or province so far as it has concerned us. In future we intend to have three sections in the magazine. The first, will contain original articles written by students and contributors The second part will be devoted to important articles gleaned from useful periodicals and the last section will contain subject matter of general interest. Occasionally we intend to include some instructive stories or personal experiences. We are straining every nerve to make the magazine a useful paper and only expect our subscribers to extend the same kind sympathy they have done hitherto.

Rothamsted Experimental Station

Harpenden (England).

(*D. V. Bal, Department of Agriculture C. P.*)

During the year 1925-26, I had an opportunity to visit the Rothamsted Experimental Station, the oldest and most famous Agricultural Experimental Station in the world. This Institute was originally started by the late Sir J. B. Lawes in 1843. It is situated at Harpenden in the county of Hertford and is about 24 miles north of London.

Sir J. H. Gilbert was associated with Sir J. B. Lawes for nearly 60 years. The former died in the year 1900 and the latter in 1901. They were succeeded by Sir A. D. Hall from 1902 to 1912 when the present Director Sir E. J. Russell was appointed.

In the year 1855 a small laboratory was built through the subscription of the farmers and scientific work was carried on in this building till the year 1914. The laboratories have since been entirely rebuilt, the main block having been opened in the year 1919 which is devoted to the study of soil and plant nutrition problems. The Ministry of Agriculture have in addition provided a block for investigations in plant pathology. The Institute is at present under the control of a Trust known as the Lawes Agricultural Trust of which Lord Clinton is the Chairman.

There are four great divisions in the laboratory-Biological, Chemical, Physical and Statistical. The usual method of investigation differs from that of an ordinary scientific laboratory where the problem is narrowed down so closely that only one factor is concerned.

Another important feature of all the investigation is that all the results obtained are subjected to statistical examination. The advantage of this statistical examination in the case of field experiments where a number of observations are recorded, lies in the fact that the complex problem becomes reduced to a number of simpler ones susceptible of laboratory investigations.

Although it is not possible to do any justice in the limited scope of this article to the various investigations that have been completed and those that are in progress at the Rothamsted Experimental Station still an

attempt is being made to give at least some idea of the outstanding work done in the various sections

(*a*) *Classical Experiments.*

These experiments known as the permanent Broadbalk wheat and Hossfield barley experiments were started by Sir J. B. Lawes 83 years ago and are still being continued without any drastic change. The data thus accumulated from these experiments have been extremely useful when subjected to statistical examination in finding out the effect of climatic factors on crop production with varying manurial treatments. Thus for example it was found out from the investigations of Broadbalk that the variation in crop yield from year to year is less with farm yard manure than with artificials; so also is the variation in the effect of rain at different times of growth. While these classical experiments yield most valuable information about the variation in soil factor. Some of these experiments are therefore repeated as precisely as practicable on other farms selected in different parts of the country to represent important soil and climatic conditions.

(*b*) *Soil Chemistry.*

Work has been done on the organic matter of the soil and it has been shown that the humus is formed from lignin and not from carbohydrates, cellulose etc. to which its origin was formerly assigned. Much work on the bases in the soil has also been done. Various investigations on the carbon and nitrogen cycle, green manuring, base exchange and barley are at present being conducted.

(*c*) *Soil Bacteriology.*

Work on the formation of nodules with special reference to the inoculation of lucerne seed, a study of the rapid changes in bacterial numbers in field soil and their relationship to nitrate increase and decrease, and a study of the soil bacteria capable of decomposing phenol, cresol, and naphthalene are some of the important problems under investigation in this department.

(*d*) *General Microbiology.*

Five main lines of research are bing pursued in this department.

(i) It has been demonstrated that in field soil the numbers of bacteria and protozoa show large daily variations, and that the changes in the numbers of bacteria are primarily conditioned by the variations in the number of active amoebae. The reproductive rates of different species of protozoa are therefore being studied both in mass cultures and in single cell cultures.

(ii) Most protozoa can exist in the soil in two physiological conditions: (a) Active, when they feed on bacteria and multiply; (b) Cystic, when they are dormant and have no action on bacteria. Investigations are therefore being carried out to determine the conditions causing cyst formation.

(iii) A study of the life histories and physiology of the different species of protozoa is in progress.

(iv) The effect of treating soil with steam or volatile antiseptics is under investigation.

(e) Botany.

The function of boron in the nutrition of various plants, the function of silicon in plant nutrition, the comparative absorption of nitrogen by barley and mustard when sown at different time of the year are some of the important problems under investigation in this Section.

(f) Department of Soil physics.

Considerable work is being done on soil cultivation, and in particular on the resistance offered by a soil to the passage of a plough, and laboratory methods have been devised to study the soil properties concerned. Dynamometer records of drawbar pull obtained in the field are in effect the integration of these soil properties, and form a sensitive measure of the variation of soil characteristics. The results show a large degree of significant variation even on areas apparently uniform to visual inspection. The drawbar pull is closely correlated with soil properties such as drainage and also with plant growth.

(g) Statistical Department.

Effects of rainfall at all seasons of the year upon the wheat crop, were evaluated. A similar study is now being made upon the responses of barley under different manurial treatments to rain. In view of the intimate relations between weather responses and manurial treatment, efforts have been made to improve the design of field plot experiments up to a level of accuracy at which they will begin to throw light on these problems.

In addition to the above mentioned department, problems on soil fungi, algae, and insect pests are being investigated in the Institute of Plant Pathology and work on various aspects of insecticides and fungicides is being carried out in the particular department concerned.

Finally mention must be made of the Fermentation department where methods for converting straw and other cellulosic material into synthetic Farmyard manure are being studied with a view to reducing the cost of production on a commercial scale.

There is a splendid library containing a complete set of most of the periodicals and journals etc, many a reference books old and new not usually found in ordinary scientific libraries. Besides efforts are made to keep the library always up to date.

Although it is not possible to give all the details of work that is being carried out at this premier and most splendid Agricultural Reserch Institute, still within the alloted space for such an article the writer feels that the readers would get a fair idea about the activities of the various departments in this Institute.

One of the important features of this institute is a very healthy atmosphere for research work combined with a true spirit of coordination.

In addition to the splendid facilities given to voluntary workers for research work there is also a very congenial social atmosphere which makes the life worth living after a day's hard work. A special mention in this connection must be made of the staff tea club. Every day in the evening all workers of the institute gather together at tea in the common room alloted for this purpose (the sample house) and spend about half an hour in talking over a variety of subjects and this provides an opportunity for one to get to know the various members working in the institute. The professors and other members of the staff are very helpful and always show a very keen interest in the work of their research students and provide them with all possible facilities.

Sir John Russell, the present Director of the Rothamsted Experimental Station is, in addition to his world wide reputation as a distinguished scientist, a very kind and sympathetic officer. The writer would never forget the splendid hospitality accorded to him by the members of the Rothemsted Experimental Station during his stay there.

In the preparation of this article use of various publications of the Rothamsted Experimental Station is gratefully acknowledged.

The Steam Tackle

(*R. B. Ekbote, IV year*)

In these days of industrial revolution man has ever been busy employing both his muscle and brain in answering his growing wants and averting the danger of shortage of food supply (consequent upon the rapid increase in population) by striving to get maximum production per unit of *capita*. At every step of his development he advances in harnessing Nature to his purpose and overcomes the natural barriers that tend to cause dimunition in return. He is concentrating his ability, energy and intelligence towards invention of new forms of appliances that would improve his land, decrease his cost of production and increase the net profit per unit. He has thus progressed from a wooden to an improved iron plough and is trying to replace his cattle power by steam. The Steam Tackle which the writer had an opportunity of seeing during the course of college tour and knowing its working, is one of the productions of man's genius, that has been recently introduced on Indian soils.

The Steam Tackle is at present undergoing trials in Jubbulpore Circle. In this tract the soil is heavy and infested with kans. This renders it uncultivable by ordinary ploughs. The cultivator, therefore, keeps his rabi weeds submerged under water during the rains. At the beginning of Rabi season he lets out the water and sows wheat with Nari plough. The increasing infertility due to absence of cultivation and presence of standing water which arrest the biological activity is obvious. Naturally, therefore there is a great demand for heavy ploughs that would turn over the stiff soil and expose kans. The Department of Agriculture therefore has started ploughing the lands with steam tackle. The description of the tackle runs thus.

As the name shows the ploughing is done by means of steam power generated by two big steam engines. These engines are more or less of the type of road engines but larger and more powerful. There is a four or five bottom-plough with duplicate sides, a provision that avoids the trouble of taking turns at the ends. There are two strand-wirestrong ropes each attached to two steam engines which are pulled by big gears. The other ends of the two ropes are fastened to the frame' of the plough. As the work begins the opposite engine pulls the rope while the one on the side of the plough begins to loosen it and consequently the plough travels from one engine to another ploughing the land in between. While

coming back the two engines move a bit forward, the raised side of the plough is pulled down and again the engines begin working in the manner mentioned above.

The cost of the steam tackle is Rs. 79,300/-and it generates 16 H. P. equivalent to 100 H. P. of ordinary engines. The maximum length of the rope is 450 yards. The plough can work therefore the length of 459 yards at a stretch but owing to the obstruction of the bunds that are constructed to hold water, maximum length is not ploughed. Naturally the time taken for ploughing a certain area is more. The tackle ploughs from 7 to 15 acres per day and cuts a furrow of 22" wide and brings to the surface all the kans that is so annoying and destroys it.

Management of breeding farms and animals.

(J. V. Takle, N. D. D. E. A. C.)

" *Housing of the animals* "

The place where the animals are kept, tied and fed is called a Barn or Gotha. The construction of this barn depends on local conditions and different requirements of the farmer. This building need not be very expensive except in cases wherefrom pure milk is produced for sale. In constructing the Gotha attention must be given to provide good light and free ventilation. This Gotha should be kept always clean and free from ticks, lice and flees etc.

All the calves should be kept separately according to their size and age. Each lot or class of calves should have an open yard for exercise and the calves in their proper shed should be kept loose so that they will run about and get ample exercise. Their feeding and watering also should be regular and at feeding time they should be taken out from their shed and put into the stanchions. When the calves are about a year and a half old, the males should be separated from the females and the former castrated at this age.

It is always better and more economical to separate milk stock from dry stock, as the care and feeding required for these varies much. Milking cows should be fed liberally as they have to maintain themselves and produce milk. The best ration for milch cows are (1) grazing for the part of day plus 10 to 12 lbs. of karbi or grass hay and 2 lbs. chuni, 1 lb. cake and 1 lb. cotton seed in two meals.

If the cow is a high milker, the grain ration should be increased according to the quantity of milk. The proportion of grain ration to milk should be for each 2 parts of the latter, one part of the former or 40 to 50 % of the milk yield.

Green and succulent fodder has got much effect on the yield of the milk, therefore to stimulate the flow of milk some provision for the supply of green or juicy fodder should be made. In the rainy-season it is not difficult to get green fodder but in hot weather and at the end of the cold weather it is very difficult to get it, therefore the green fodder should be stored in a pit called a Silo, at the time green fodder is available in large quantities in the month of October to December. It forms good juicy fodder at the time of scarcity and, to prepare it does not cost much. By the use of this type of fodder cattle remain in good health and breed regularly. If given to calves, they make rapid growth and much of the grain feeding is thus saved.

The quantity of silage required by each animal varies from 15 to 20 lbs per day in addition to the hay or kadbi. There is no harm if the proportion of this is increased to 30 lbs. per day per head.

Feeding the bull

A thin, weak bull invariably produces calves lacking in vitality. An overfat bull is often an uncertain breeder and may also produce weak calves; therefore the bull must be kept in good condition. The condition should not be mistaken for fatness, just because an animal is fat is no sign that it is in good health and condition. If the bull is very fat it is better not to use him for some time till he comes in good condition, for breeding.

The bull should be given as much fodder as he will eat clean and about 4 to 6 lbs. of grain ration consisting of chuni, oil cake, cotton seed or bran with an allowance of about 1 to 2 tolas of salt per day. With this ration a bull will remain in good condition and will be always active.

The bull should, if possible, never be allowed to run at large with the *head*, but kept quite separate in a well-fenced paddock and when required should be taken out, other wise there is a risk of immature females being covered.

Pregnant cows should be separated from other dry animals and kept in a separate stall especially at night. There is no harm if the cow calves

in the fields or in pastures during day time. The stall where the pregnant cows are tied at night should be clean, free from manure and urine and the floor should be well bedded and level.

The conditions under which cattle are maintained in this Province are so varied that the popularity of particular breed varies from district to district. In the Nagpur Division the demand is for Gaolao cattle while in Northern Districts the popularity is shown in the more heavy type of breed like Malvi; the Agricultural Department has surveyed the whole province, studied the local conditions and accordingly decided what particular breed is suited to the particular tract and a breeding herd of that particular breed has been established on a Government Farm to suppy bulls to the neighbourhood.

In breeding up a herd of any class of cattle the bulls used must be a good individual of the special breed he belongs to and to produce such bullsrequires a good number of years hard work and selection and expense, so the price of such bulls is always relatively high. Money spent on a good bull is money well invested as his price when compared with the improve ment in the large number of calves he gets is very small.

To achieve success in the improvement of cattle it is more econo mical to have a small herd of better cows than a big one of useless cows.

The small herd can be easily managed by any farmer, well fed and housed and the rigid selection of better calves to breed from is easier to make. All the useless and unserviceable cows should be weeded out and kept for producing manure only. They should not be bred from, only in this way can our herds of cattle be rapidly improved.

In our province the present herd of cows is not at all economic one. The size of the herd is in many cases bigger than the farmer can manage both from the point of view of feeding and grazing.

Such animals even though coming from good parents do not develop into good ones and being partly starved do not become good breeders. They may give one calf in every three four years; on the contrary if the cows are well fed they generally produce one calf every year or every year and a half and the calves they *drop* are healthy vigorous and ready to respond to proper care and feeding. To rear such calves is very easy and it will pay the cattle owner more to rear 4 or 5 good calves than to rear double treble that number of weak and bad calves as is done at present.

Our present stock of cows do not yield much milk and whatever they yield is not even enough for their calves, so the Department is trying to improve the milk-giving capacity of the cows whereby after maintaining the calves the cows will contribute something to the pocket of the cattle-owner in the form of excess of milk.

Everybody knows that milk is one of the best of human foods and for want of it many children are dying every year and those who survive are often miserable men and women as a result of the malnutrition during their childhood. The health and development of a nation depends upon proper nourishment of its young generation and for that purpose milk is one of the best foods for proper physical growth and mental development. It contains all the nutrients that build bones, tissues and healthy minds. Bad milk however is a danger to human beings and therefore great attention must be paid to purity and cleanliness in handling it. To produce first class milk, the milk giving animal-cow or buffalo-should be in perfect condition of health. Milk from sick animals should never be used. The milk is manufactured from the food the animal eats, therefore it is evident that to get good quality of milk the animal must be fed liberally. If the cow is given bad food the milk also will be bad.

If the milk is not properly handled, it turns sour and curdles soon, so great care should be taken to see that while miking, the animal is clean if it is not clean it should be groomed or washed, before milking.

The men who milk the animals should have clean habits and should themselves be clean. The utensils in which the milk is drawn or stored should be well washed and dried after use. Milk should be kept in sealed vessels and at a low temperature until used; otherwise it will become contaminated and become a breeding ground for the germs of many diseases.

The Tillage of Soil.

(R. G. Allan, M. A. Principal., Agricultural College Nagpur.)

General

TILLAGE is the chief agent which man employs in his attempts to control vegitation to his own needs. Manure, drainage, irrigation and the restriction of soil movement may at times and in places be factors deciding the limits of this control, but none of these can be effective without tillage.

Tillage on the other hand can be and often is instrumental in aiding these factors of effective crop production and may indeed be utilized to render such special applications of capital of less necessity. Early English writers on farming matters placed an unlimited confidence in the efficacy and importance of tillage.

The Indian cultivator, depends almost entirely on the effectiveness of his cultivation as a means of raising his crops. Allowing that his Monsoon rains are favourable success is measured at one time or place by the amount of attention which he gives this factor.

Tillage as an aid to crop growth aims at effecting this purpose by four ways.

(a) by preparing a suitable environment or condition of soil as will best help the germinating seed and the plant in its later growth i. e. by the preparation of the seed bed.

(b) by preventing competition for food, water, light and air between the selected crop and rival forms of vegitation, i. e. by destroying weeds

(c) by aiding in the control of the water supply of the crop, a very variable and often an all important factor governing successful growth.

(d) by stimulating the conversion of inert chemical combinations in which the elements essential to plant growth are found to forms which can be available to the plant, either directly or by the id of oial bacar which in their turn are stimulated

or retarded in their development and actions by the air and moisture conditions existing in the soil.

The condition which effects these objects is known by the term "tilth." Each crop has its special requirements in regard to this and to provide this, account must be taken of the varying influences of soil, climate and season.

A good tilth is clean, sweet, moist, fine, firm and to the depth required for the seeding and growth of the plant. Such provides what is required to meet the objects stated.

Any cultivation, given in the processes which precede sowing or later, when the crop is up, must have some influence in all these directions. It is not possible in practice to dissociate the one from the other. A special operation done with the intention of removing "kans" will also effect a change in the nature of the seedbed and will alter the amount of moisture at the disposal of the subsequent crop.

In the process of preparing his land to receive the seed and during the later growth of the crop a farmer, however, at any one time or at any one place will be influenced in his actions by which of these objects is the main one in view. The nature of the operation and the method of its fulfilment and the means adopted will in consequence vary. We may take an example. A field otherwise suited to cotton is infested with "kans" grass. The owner decides to plough this field deep using an inversion plough. Such treatment is influenced by the essential need of removing this weed. In electing to take this step he regards this as of paramount importance and is willing to risk an over-loose seed bed, the possibility of excess soil moisture and the dangers of late sowing.

A grower of a "kharif" crop or the farmer of humid climate directs his efforts essentially to the making of a seed bed and the aeration of his soil. A grower of "Rabi" crops or the farmer in a semi-arid tract devotes his special attention to the conservation of the moisture in his soil. In consequence, though both are seeking the same object–the best welfare of their respective crops–the manner in which each tackles the problem will differ widely. On this account, though any act of tillage will affect all these interests, it is possible to consider tillage problems from each standpoint severally.

Tillage Technique.

In this series I propose to deal in the first instance with the technical side of cultivation leaving the equally important economic aspect till later

The Making of the Seed-bed—Tilth.

(*a*) *Aeration.*

One of the first requisites noted earlier as the feature of a good tilth was sweetness. A soil which has carried acrop, particularly if this has been a cerial or fibrous rooted crop, tends to become hard and compact. Shallow surface cultivation after this and in preparation for the next crop seldom lends itself to as good a yield as might be. This is chiefly because the aeration of the soil has been defective. Oxygen is wanting.

Aeration is one of the main objects of tillage. Prolonged aeration produces what the farmer calls *sweetening*. This is not merely connected with the adequate supply of oxygen for the seeds, roots and beneficial bacteria, as the soil may be sweetend while these are dormant. Long and thorough exposure to the atmosphere facilitates pulverization and ensures aeration, as witness the changes which take place in the nature of a heavy soil when ploughed in January and left till June. Aeration of this character probably benefits and produces what is known as *sweetening* by the decomposition of harmful organic substances and the destruction of soil protozoa which, if not so weakened, prey on the more beneficial forms of bacteria which become active under the influence of increasing moisture under Indian monsoon conditions or under the influence of increasing warmth in colder climates. To ensure aeration the soil must be broken up and broken to a fair depth, dependant on the nature of the soil and the past and future crop, and left in a form which will allow the passage of air. If the next crop is to follow soon after the first cultivation, the initial process of inversion ploughing or in other cases country ploughing or cultivation by the aid of some grubbing implement must be followed as soon as possible by other methods of pulverization, when the moisture condition of the soil permits. On the other hand if the soil is to go through several months of rest and the more, if during this

period rain is to be expected, pulverization should be avoided and the soil left as coarse as possible, as in this condition it will be less liable to run together and thus to exclude the free passage of air.

The rough surface of a field, deeply worked in January or later tends to allow the percolation of water without facilitating the running together of the soil particles, a condition which would at once demand further tillage. It also exposes more surface to the air than can be got by any form of non-inversion cultivation.

From the point of view of effective aeration such a soil, so ploughed in the spring and destined for a future Rabi crop, is best crossed ploughed in the Rains. Allowing adequate consideration of other factors, the deeper the ploughing the better the aeration.

(*b*) *Moisture.*

The importance of an adequate supply of moisture in plant growth is well known. The importance of its effective conservancy for the use of the longer standing "Kharif" crops in many parts of India and for the dry "Rabi" crops in all parts of the country by the aid of tillage is fully recognized. As I will show later, it governs much of agricultural practice and supplies the reasons for the variations found in different parts of the country in course of cultivation of the same crop. The rain actually received in the cold season would of itself be entirely ineffective in providing for the moisture require ments of the "Rabi" crop. Though we may have reason to believe that we frequently get more moisture in our soils than is essential or desirable for the welfare of the open cultivated "Kharif" crops, there is no doubt that on the adequate storage of the rains of the Monsoon depends the possibility and the fate of the following cold weather crop.

For these crops land should be deeply ploughed, so as to catchas much as possible of the early rains of the Monsoon. The most effective ploughing is that done on the first removal of the past crop, as this permits of the possibility of hot weather aeration. This is strongly recommended by writers on the subject dealing with the soils of the Gangetic alluvium.

On the heavier black soils of the Deccan and Central India however, the land is not infrequently too hard and ploughing in this season is too costly to be an economic proposition. Under these conditions, unless the pressure of "kharif" sowings is likely to be too heavy, the earliest possible attention in the Monsoon is called for.

This ploughing should aim at leaving the soil as open as possible so as to allow of the ready passage of water to the subsoil. An effective open ploughing, such as is best secured by the use of a plough fitted with the longer convex mould board rather than one of the more abrupt types, at this season also facilitates work later in the monsoon or at its close and thus reduces evaporation losses. Cross ploughing in the last fortnight of August, when practicable without damage to the soil structure, in this case using a lighter plough like the "Monsoon plough", opens the soil which has tended to get compact under the heavier early rains and thus permits the entry of the latter and all important rains of September. It also facilitates the drying out of of the upper surface and thus its furthur refinement.

This refinement of the soil is probably best secured by the use of a spring-toothed harrow or light cultivator, followed by the disc harrow or bakher and finally by the spike harrow, though, if the land is clear of weed, as it should be, it should be possible to eliminate the disc or bakhar and secure the necessary surface fineness by the free use of the harrow, or if the clods have dried to hard by its use in combination with a planker.

The actual seed bed must be in close connection with the moisture supply below. In most cases this connection, broken earlier by ploughing, will have been reestablished by the pressure of the rain received subsequent to ploughiug, but if the ploughing has been late and the use of the spring toothed harrow has opened the soil to too great a depth steps must be taken to refirm the soil. For this purpose the modern cultipacker is an excellent implement, though failing its possession by the farmer the planker or heavy log may be used. This re-firming is best done after a dry layer or mulch has been provided on the surface. After the use of the cultipacker or roller it is essential to take steps to re-loosen and restore the

mulch. The harrow with its teeth set vertically is a useful tool at this juncture, as it effectively stirs a large area in a day.

Successful crop growth is dependant on the *existance* of this mulch over the water conserved by the earlier treatments and on its maintenance after the crop is up. Here again, if light rains have fallen out of season in November and early December before the crop is big, crossharrowing using a modern harrow with its tynes set backwards or even a fine pointed detari, constructed so that when yoked for work the tynes strike the soil pointing slightly to the rear, will benefit the crop by breaking the rain-formed crust and restoring the mulch A healthy crop suffers little, if at all, by such treatment.

It may happen that long continued rainand wet soil have prevented secondary cultivation during the monsoon and have allowed of the establishment of weeds compelling ploughing with an inversion plough or deep cultivation with the country plough or heavy cultivator at the close of the Rains. When this rather too late ploughing or deep cultivation is necessary, such ploughing should be concentrated in character, so as to provide a complete block as the result of one days work. The ploughed the area of each day must be carefully watched and the moment that the action of the sun has dried out stired layer so that the moisture contents permit cross working, this should be done. There is always a time when the moisture contents of a ploughed layer of soil are such as to facilitate the very rapid breaking down of the soil under the action of some secondary implement. This may be the case within 24 to 48 hours after ploghing under the hot sun of September. If this work is done too soon, hard puddled clods may result; if delayed the plough furrow will lose too much moisture and harden. It should then be worked with the springtoothed harrow (or if not available, the bakher) rapidly to near the depth of the cultivation just completed, so as to pulverize the soil and loosen out the weeds. This should be repeated, if necessary, working to a lesser depth. Time should then be given to allow just the top surface to dry whereupon the cultipacker or planker should be used to firm the subsurface layer and re-establish connection with the subsoil. Subsequently the bakhar (or disc harrow, if available) and the spike should be worked to provide some three inches of soil mulch and separate out the weeds.

If this procedure is adopted comparitively late ploughing of 4 to 5 inches depth can be resorted to, the essentials to success being concentration of ploughing effort, ability to recognize the exact moment when secondary cultivation becomes possible and the use of effective pressure to refirm the lower loosened soil.

To this point we have considered the increase of the soil moisture by the aid of tillage, as essential in all dry "rabi" crop cultivation and a matter of consideration in the cultivation of "kharif" crops, as for instance Cotton, in areas of light rainfall. The chief features were the opening of the soil to allow of the passage of water to the subsoil and the provision of a mulch either before sowing, as in "rabi crops, or during growth by effective intercultivation, as in the case of "kharif." Tillage may however be applied to lessen the water in the immediate region of the roots. The plant, it is true, requires water but it must also have air, a necessity which is not infrequently missing during the heavier rain periods of the monsoon in particular on heavier soils and in low positions. The moisture the plant uses is that which is sometimes defined as "film" water. Water in excess of this and thus filling the pores or air spaces in the soil in the root zone of the plant is harmful. It produces what is termed waterlogging. In the wetter parts of the black cotton soil tract and in fields which receive more than the actual area rainfall excess water in July and August is a common retarder of growth and a reducer of yields.

Tillage control in this case takes the form of lifting the plant above the general field level or the places to which water will gravitate, thus providing a deeper zone of "film" water containing soil. This is arrived at either by so ploughing the soil round a central ridge or ridges for a number of years as to convert the surface of the field into an undulating surface carrying drainage channels at intervals separating raised ridges, as has been effectively done on the College farm or by laying out the land, in the final steps of preparation before sowing, into ridges and furrows or into raised beds, carrying two to three lines of crop separated by water channels of 4 to 5 inches depth, as is being advised in Gujerat. Again at times the harm done by excessive water round the young seedling arises from imperfect or slow percolation of

the water as has been received in the upper or cultivated zone into the lower levels where there may be ample room for it. This impervious character of the subsurface soil, which may at times be natural and at others the outcome of a "pan" produced by long cultivation at a uniform depth, can be remedied by subsoiling or grubbing up the soil below the ordinary ploughing depth.

To be continued.

Twenty Years Old Fresh Eggs.

It is supposed that it was at a reward for the crowing of the cock that roused St. Peter's conscience that eggs laid on Good Friday would keep for twelve months. Dr. C. E. Shelley, of Hertford found, that not only Good Friday eggs but those laid on any other day would keep even for twenty years. The Doctor has still some which he kept for that long period and they are quite fit for food though they have now dried up and resemble lumps of burnt sulpher. In the legend it is stipulated that the eggs to be preserved must be absolutely clean.

This is the soundest advice that could be given, for if put away dirty the eggs would very soon be contaminated by bacteria. The only secret of keeping eggs without preservators for years is to make sure that they are perfectly clean. The Doctor kept his eggs in a cardboard box in a room that in the summer was flooded with sunlight.

Belapur Sugar Factory

(*R. A. Ramayya L. Ag.*)

Sugar is one of the articles of food that is in common use among the people, but it is an article the manufacture of which is least understood by them. To the chemist, sugar is simply a compound of carbon. The common run of people however, value sugar as sugar and not as a compound of carbon, hydrogen and oxygen. An attempt is made here to describe sugar manufacture in a general manner without entering into details of the chemistry of sugar.

The sugarcane is cut in the fields and sent to the factory in truck loads which are driven by petrol locos. The factory is connected with a net wore of rails in order to get the cane direct from the fields in as short a time as possible after it is harvested so that there may not be loss in actual sugar content. The company has under its direct control 6000 acres of land out of which in any one year 2000 acres of land are put under sugarcane. Harvesting operation begins on Monday and on that day only 200 tons are sent for crushing and on the following days together with 300 tons every day, deficit of 100 tons of Monday is made up, thus crushing in all 1800 tons a week, Sunday being holiday for the factory. The cane coming in truck loads is weighed directly as in the Railway and the weight of cane sent for crushing is recorded. Each truck load of cane weighs nearly 3 tons The truck loads are emptied direct in the cane carrier which has the endless chain arrangement as in ensilage cutter and thus the cane is carried up to the mills for crushing.

Process of crushing

Cane crushing is the first process during the manufacture of sugar. There are three mills used in succession for crushing the cane and thus have complete extraction of the juice. The first mill consists of crushers, three in number which have cutting edges and furrows. Here the cane is sent into 9" bits and is crushed partially by being pressed between the crushers. The juice extracted here is the best. The cane coming direct from the carrier is crushed here and to regulate the feeding in order there may be no checking, there is a clutch arrangement by which feeding can be stopped whenever found necessary. The distance between the

rollers in the first mill is the highest and it is reduced in the subsequent mills, thus having the least distance in the last mill. The distance between the rollers is adjusted by means of hydraulic loads. The rollers are arranged horizontally with vertical grooves. The grooves on the roller are bigger in the beginning and smallest in the last rollers. The grooves are meant for the outflow of the juice extracted, and to hold firmly without slippage any material other than juice.

The partially crushed cane from the first mill passes to the second wherein further extraction is done. The material coming out from this, on its way to the third mill is macerated by the addition of water through jets. The macerated material passes through the rollers in the third mill which have roller to roller type of arrangement having imperceptible distance between two rollers. Thus, complete extraction is done here. The juice extracted by the third mill being diluted due to maceration, is strained through the strainer and is pumped up to the material coming out of the first mill. This straining of juice is necessary in order to avoid the choking of the pump. Final crushing being done in the third mill, the material coming out is called the Bagasse (or magassa by English writers) containinins 50o/o of mais goes to the boilers.

After crushing

The juice tank below the second mill receives all the juice from the crushers and the juice is passed through the strainer. The residue left on the strainer is scraped by the scraper which passes over the strainer. The juice after being strained is pumped up to the sulphur box. Sulphur put in the sulphur stove forms sulphur dioxide which bleaches the colour of the juice and acts as a preservative of the juice. In the sulphur box there are cross plates through which the juice falls in showers. The idea is to mix the juice thoroughly with so 2. The gas is passed from the bottom upwards, and the juice falls from top downwards. After this, the bleached juice passes to the measuring and liming tanks. When once the tank is full, it is tested for acidity and the required amount of lime is added in the form of lime cream. Lime is necessary in order to neutralise the excess acid and bring the acidity to 60 and also to clarify the juice. It is quite essential that the juice should be a little acidic because alkalinity brought about by excess of lime will produce brownish sugar. Hence, to produce white sugar, the juice should be a little acidic for which the regulation of lime addition is quite essential. The capacity of each tank is 880 gallons and there are three such tanks. In order to have a thorough clarification with lime, compressed air is passed through the valve into the tank and thus the juice with lime is well stirred. After the tank is full, the juice is let into the bottom tanks.

Heating the juice and after

The pump below, by the side of bottom tanks, pumps the juice to juice beaters which are two in number. Steam heats the juice. The steam does not come in direct contact but passes through the steam coils which heat the juice. The temperature at which the juice is heated is about 85 to 90 °c. The juice enters the tank at the bottom and the hot juice at the top escapes through the outlet and passes through a channel which leads to the settling tanks and the juice is allowed to boil for a second or two. This boiling is done by steam boilers at the bottom and the boiling is controlled by the steam inlet valve wheel. There are eleven such setting tanks Capacity of each setting tank is the same as liming tank. After boiling for a second or two it is allowed to settle for about half an hour. The upper scum which forms contains the floating impurities, clear juice below, passes through the outlet. Still, the clear juice contains some floating impurities for the removal of which the juice is passed though filters containing cotton bags. There are 6 bag filters of this type each filtering tank containing 144 bags packed in the holes. The bags are washed at the end of each working to ensure efficient work. Muddy impurities settling in settling tanks are taken through channels into the bottom tanks called mud tanks similar to the upper ones. In the mud tanks, the same process as in settling tanks is followed and the resulting mud is passed through presses after being pumped up. The mud press has a plate and a frame in alternation. The clear juice pressed from the muddy impurities comes out through the outlet cocks. There are 3 such presses. The mud cakes coming out from the presses go down, which are removed and used as manure. The manurial value of these mud cakes consist in their lime and organic matter content.

Concentration of the juice

The clear juice free from impurities is pumped up into the supply tank. The supply tank is a reservoir to supply juice for evaporation of excess water and thus make it concentrated. For evaporation of water and concentration of the juice there is what is called tripple containing three bodies. Evaporation is done by letting in steam to the first body. The juice in the second body boils from the hot vapour passing out of the first and the juice of the third from that of the second. Concentration begins with the evaporation of water. Higher the concentration, less would be the temperature. It is necessary to control the temperature because higher temperature than necessary would char the sugar. This temperature is controlled by vaccum. The temperature and pressure in the different bodies is as noted below:–

	Temp.	Vaccum.
1st body	95 °c	5 "
2nd body	80 °c	15 "
3rd body	55 to 60 °c	26 "

The temperature in the last body where the concentration of the juice is high should never exceed 60° The concentration of the juice in the third body is 55° as indicated by Briggs sacharometer, while the concentration of the ordinary juice fresh from cane is 18° Briggs. Vapour from the last body of the tripple is taken up and condenced and this is how vaccum is created. When the required concentration is reached it is called syrup which is pumped into the syrup tanks which are 3 in number. The syrup is taken into the vaccum pans which are 3 in number and which are worked under 26 " vaccum. Steam is passed through coils, boiling the syrup and thus excess water is evaporated. The syrup comes into the crystallisers from the vaccum pans. With the evaporation of water from the syrup, the sugar in it can no more remain in solution and thus forms very minute needle-shaped crystals. Further, crystallisation begins with the deposition of fresh crystals, thus forming aggregates of large crystals. In this way, the crystals can be made to form to any size.

The syrup is not all sugar. It contains a thick liquid called molasses. This syrup containing both molasses and sugar is massecuite. The massecuite is stirred. This stirring is necessary to get the crystals not in aggregates coalescing each other but in a free form. The massecuite while being stirred is cooled simultaneously by allowing it to stand for some time. From the crystalliser the massecuite comes to the centrifuga tion. The centrifugaliser have a sieve lining at the sides. Sugar is caught at the sides and the molesses pass out through the jacket. The molesses called the run off is sent to the Government distillery at Nasik for the manufacture of rhum. It my be used as manure also. The sugar that is caught is washed by spray to remove the molasses attaching to it. Finally scraping is done and the sugar emptied below. This sugar collected below goes to the drier. The sugar is lifted up into the hollow drum by means of the cups on an endless chain. Inside the drum the sugar is turned round and round and a blast of hot air passes continuously driving all the miorsture; the dried sugar falls down below which is taken up to the sugar grinder to get fine powdered sugar. This ground sugar is collected below into bags and the weight in each is noted down.

There are 3 varieties of sugar manufactured by the company. No. I sample consists of crystalline sugar prepared directly from syrup and this sugar can be compared with any such sugar produced in other foreign countries. Sample No. 2 is the ground sugar from this

crystalative sugar. Sample No. 3 consists of the sugar which is manufactured from the molasses recorded from the first sample. This No. 3 is inferior to the other two and is cheaper than them.

Working of the company

The company is a limited one and has got a Board of directors and trustees. The work is managed by a manager who has under him an efficient staff of engineers and chemists to whom is largely due the efficient and smooth working of the company. The factory is situated at Harigaon, five miles from Belapur station on the Manmand- Dhond Railway and is connected with the station with railway lines for easy transport of sugar. It is very busy during the season beginning from Novemb. r right up till April. During this season, the factory runs all the 24 hours with three shiftings of workmen who number 60 on each shift. The labourers come for work from the surrounding villages work of manufacturing sugar began from the year 1923-24 before which Gur used to be manufactured for about four or five years. It can be said without the least hesitation that the Belapur sugar factory is second to none in its organised work and manufacture.

Aware of the need for *home* made sugar, the company came into existence and the well being of it depends upon the countrymen who should take to Indian made sugar in preference to foreign sugar though be it a little dear in the beginning; this is bound to be so in the beginning as sugar industry in India is still in its infancy.

There is a great scope for sugar manufacture in India as India has the largest acreage under sugarcane; only the yield is low and compares ill with other sugarcane producing countries like Hawaii and java which produce 30 to 40 tons of cane per acre. Much depends upon the encouragement that is given to the home made sugar.

The Farm House.

The farm house is the most important building in the farmstead group and its planning is often the most neglected. The factors of climate, protection, proverty and riches all have their influence on house construction. After food, man's next need is for a shelter. The many problems of the home demand that the house plan should be carefully planned.

The house is a shelter for the child at birth, a protection and refuge during growth and maturity and a comfort to the old man in declining years. The farm house is the woman's domain, where she spends most of her time in the care of the family, in the planning and serving of meals and providing for recreation, rest and sleep. The house is the business centre of the farm and the business of buying and selling is largely planned there.

Every house is a separate problem and requires separate treatment. There are very few plans which embody all of the features desired in the house, because the number in the family, the size of the farm, the amount of money available, the value of the farm and the taste of the owner all affect the planning.

The architect is able to plan a house corrctly and avoid the msitakes which are sure to come from amateur planning, yet the architect is often unfamiliar with the problems of the form and needs consultation with the farm owner. The best method of planning the farm house is by the co-operation of the owner, the architect, the agricultural Egineer; for hrough their combined efforts, the problems affecting the design may all be met.

Some typical farm houses seen at the last Poona Agricultural Show induced the writer to pen a few lines on this most important subject. The importance of planning will be readily realised if the fact is borne in mind that several house owners have been required, in absence of a regular plan, to make too frequent changes which have resulted in very heavy expenses. The house owners have in many cases run heavily in debts and the disinterested people have only quoted the wellknow vernacular proverb which signifies that Marriag and Home Building are such matters in which, no pre-estimates are possible. It is therefore very necessary that the house must be very carefully planned.

The house should be so panned that regard will be had for convenience, efficiency and beauty. The square or rectangular house is the most economical for space and materials; the preference of the owner, however, will determine the exact size and shape.

The kitchen should be a light clean room with windows in two sides for light and ventilations. The dinning room should be ample in size. A modern farm house should also provide for recreation. Music Room and library must have their assigned place. Farm house must have a farm office where to keep business records and correspendence. It is desirable that the room be located to afford a view of the barns and fields from the windows. The bed rooms should have cross ventilation and two or more windows to each room. A house for the average farm should have three bed rooms Since the house is a special problem, the writer intends some time to give a typical case or two suitable to the needs of farmers with average means.

It should be the duty and pleasure of the entire family of the farm to take part in the planning of the new home. The following outline of the method of planning will be of help.

Select location. Determine the number of rooms desired, for present and future needs and select roof shape. Decide upon shape and possible size. Locate kitchen with exposure and view. Locate dinning room, plan living room and ultilize remaining space for office, bed and rooms. Decide upon size of rooms, and plan for economy of materials, plan doorways leaving space for furniture, locate windows, plan arrangement of second floor, study front and side elevation views proportion, mass shape and symmetry. Group windows in elevation for appearance, change windows in plan to fit elevation. Make plans in pencil, to scale, with dimensions. Trace plans and elevation. Draw details of constructions and complete drawings.

Gardens.*

(T. N. Deshmukh, Nagpur.)

'More gardens, better health,' is a statement that can hardly be refuted. A beautiful garden is a small paradise. In fact paradise has been described by some as a large space of ground, adorned and beautified with all sorts of trees both of fruits and of forest, either cultivated like gardens for shades and for works with fountains or streams and all sorts of plants usual in the climate and pleasant to the eye, the smell or the taste or else employed like our parks for inclosuse and harbor of all sorts of wild beasts as well as for the pleasure of riding and walking.

If we believe the scriptures, we must allow that God Almighty esteemed the life of man in a garden the happiest he could give him. It is for that reason that Adam was placed in the garden of Eden where the life was one of innocence and pleasure Gardending is one of the few absolutily delightful and healthy occupations that we can have resort to even in these days.

As to the size of a garden, four or five to seven or eight acres is as much as any gentleman need design, and will furnish as much of all that is expected from it, as any nobleman will have occasion to use in his family.

In every garden four things are necessary to be provided for flowers, fruit, shade and water and no garden can pretend to be perfect without all these. It ought to lie to the best parts of the house or to those of the master's commonest use so as to be but like one of the rooms out of which you step in to another. The part of the garden next your house should be a parterrer for flowers or grass plots bordered with flower or if, according to the newest mode, it be cast all into grass plots and graval walks, the dryness of these should be relieved with fountains and the plainness of those with statues, otherwise, if large they have an illeffect upon the eye. The part next the house should be open and no other fruit but upon the walls If this take up one half of the garden, the other should be fruit trees If is take up a third part only then the next third may be dwarf trees and the last standard fruit; or else the second part fruit trees and the third all sorts of winter green, which provide for all seaseons of the year.

* With slight adaptations—Editors.

The best figure of a garden is either a square or an oblong and either upon a flat or a descent; they have all their beauties but the best is an oblong upon a descent. The beauty, the air, the view, make amends for the expense which is very great in finishing and supporting the terrace walks, in leveling the parterres and in the stone stairs that are necessery from one to the other.

But it is not the average man in this country who can thus lay out a garden. Most people, however, can have a vegetable garden. Many houses have yard which lies iole full of weeds grass and other filthe material which is so harmful to the inmates of the house. If this littll piece of ground be converted into a well laid out family garden, it will add to the better appearance of the house and will bring an extra incomy to the family.

Gardens will not plant themselves not will they take care of themselves after they are planted. We produce in proportion to the amount of thought and effort we expend. We have to be up and working. Home grown vegetables are fresh and cheap. One will have greats variety and will eat less dirty market stuff and save doctor's bill to a great extent. More fruits, vegetables, milk and eggs mean better health, more happiness and more wealth.

Preliminery cultivation.

The first requirement in gardening is proper and thorough tillage. In the months of march or april, plough the land with turnwrest plough or if it be already plouged, bakher it deeply. Remove all abominable plants like babul, and ber, which are generally found on such land. Ploughing and shading thus will expose the insect pests which will be killed by exposure to sun and birds. Make the soil loose and porous so that it will retain more moisture and allow the air to act on. Then work out a cultivator if possible and crush all clods with a roller and pick up and remove all big stones. Seed bed should be as fine and pulverised as possible in this case. For winter crops one monsoon ploughing and bakhering would suffice.

Thus after the land is cleaned and cultivated, manure the land with one good cart load for 400, sq. ft. of ground. This varies according to the kind of soil and the nature of the crop to be grown and quality of manure applied. Root crops require deep spading or ploughing because their roots go deep into the soil. The surface of seed bed should be made almost level and smooth with a slight slope from the centre of the bed towards the borders. Before planting, see that the soil is well pulverised

and the surface of the planting bed is made smooth. The soil if lumpy use a hand roller or a clod crusher. After this apply to the land a good dressing of one or two cart loads of wood ashes or bone meal which is very good for garden crops.

Manuring

Make a compost pile near or in your garden. Compost is made by piling a layer of soil on top of a layer of manure; then a layer of leaves or any organic matter such as straw, stable manure, leaves, grass clippings, plant and meat wastes, bones, tree and shruby clippings, all piled mixed and allowed to decompose during winter. This pile should be turned over twice during the winter months and applied to the garden later on. Before applying make compost by forking over a pile of materials to mix thoroughly. Compost is one of the best fertilisers and helps vegetable growth, when scattered over ground, around young plants.

Poultry droppings are very good but should always be applied as a dressing in winter. These are strong in nitrogen. All manures should be well rotted before applying to the soil. Raw fresh manures should never be allowed to come in contact with young seedlings or plants.

Artificial manures are nitrate of soda, acid phosphate, dissolved bone, pulverised sheep manure etc. No definite rule can be given for kind, quantity and quality to be applied, as these vary with the crop to be grown and land tobe fertilised.

Do not waste wood ashes; they contain a large percent of potash. Spread them over your garden soil.

Plan

Make out a plan of your garden to guide and direct your work throughout season. This will give you better results in the long run. Arrange the cropping scheme and rotation of crops according to the time of sowing and harvest so that you may have a continuous supply of vegeta bles. Mark out on the plan rows, ridges, beds, furrowes, etc, for the respective crops. Locate your permanent crops where they will not be interfered with. Consider appearance and plant the higher growing vegetables and thick growing ones at the rear of the garden and lower growing ones in front or near the house. Such an arrangement will be most attractive and forms a screen at the rear of the garden. Do not let the high growing plants shade the low growing ones. Never allow your garden to over-crowd and always be removing the weeds. Never allow weeds to go to seed. The plan should show the distance

between rows, space between plants and names of varieties to be grown. Watering channels also should be located on the plan. Drainage also must be looked after.

Implements

Make up an itemized account of the things on hand and things needed.

Tools which are useful:—Spade, rake, kudali, pawaras, hand hoes, forks, tapeline, long straight stick markers, labels, garden line, khurpies, sickle, knife, clipper, water spraying cans, etc. Though these tools are not all needed at once still they are useful in garden work. Have a place for every tool and keep every tool in its place carefully. It is most annoying to find tools missing and out of repair when you most need them.

General.

Seed rate will vary according to the nature of seed, kind and quality. Do not waste vegetable seeds. Only good and tested seed should be planted. Buy seed always from a reliable source; do not buy mort than you need. Test your seed before planting to save time, moneyt and disappointment Seeds are good when from 80 to 90 out of ever,l hundred will germinate. Take your own sample; count out 20 or more any test them. To test use a kitchen plate, cut two pieces of blotting paped or cloth, lay it in plate after wetting thoroughly; drain off the surplus water; scatter the seed evenly over blotter or cloth and cover the seer with the same Cover the plate with glass or another plate to prevene evaporation and place it in warm room. If the seeds are good they will sprout in 3 or 4 days. Keep the cloth moist all this time.

Care must be taken in handling the plants. All seedling plants should be given a good watering a few hours before transplanting. This prevents wilting and keeps fine soil sticking to the roots. With a stick or dibble, poke a hole directly in lines being careful to make it large enough. Place the roots of the seedling in the hold. Press the soil in, lightly from all sides, and plant a seedling. Water the plants; this is best done with a fine spray or a sprinkling can. Do not apply water in quantities and with force as to wash the seedlings or seed out of the soil.

Thin and cut your largest plants first; in this way you thin out the rows, allowing the remaining plants to develop better vegetables.

Plants such as tomatoes, and vines, cucumbers, bean etc. require support and are fastened to stakes, trained on supportes, and tied up. This is done to keep vegetables, of the ground, to keep the plants from breaking, to give better exposure to sun and air.

Whenever you harvest vegetables be sure to remove any refuge that remains. Do not let the leaves of plants lie in the garden. They attract flies and other insects. Throw all the refuse on the compost pile where it will decay, and make fertiliser for the next year. Many garden insects live under this loose material left in garden. Dead vines, leaves and roots are sometimes covered with disease spores, insect eggs, and pupae and should, in such cases be burnt.

Insects are divided into two kinds–sucking and chewing; e. g. Catterpilers, bugs.

Chewing insects are destroyed by spraying the plants on which they feed with arsenical poison, Paris green, or arsenate of lead. Kerosine emulsion is also good.

Ask children to watch and pick insects and destroy them. This will encourage in them a habit for nature study and interest them too.

Always market surplus vegetables insted of wasting, which will fetch you money.

List of successful candidates

Annual Examinations held in the month of February 1927

Fourth Year Diploma

1. Aliyar khan
2. N. K. Pillai
3. D. Das Gupta
4. Bhusashri Dutta Mishra
5. R. N. Gadre
6. R. A. Ramayya

Third year Diploma

1. A. B. Dutta
2. S. P. Kolte
3. B. R. Ekbote
4. N. S. Sapre
5. S. P. Malewar

Second year Certificate

1. R. P. Verma
2. S. N. Tiwari
3. R. D. Deshpande
4. B. L. Kajway
5. S. N. Kothekar
6. K. R. Sowley
7. K. G. Phatak

Second year Diploma

1. W. R. Gupta,	2. R. G. Ashtikar
3. G. T. Joshi	4. G. E. Talwalkar
5. W. R. Sathey	6. S. N. Nafdey
7. K. B. Joshi	

First year Degree

1. K. E Simlot	2. P. R. Dixit
3. Hatim Ali	4. R. F. Upadhays
5. R. C. Ghosh	6. R. G. Joglekar
7. S. K. Salot	8. N. B. Chincholkar
9 D. V. Varadpande	10. N. G. Sirpurkar
11. N. P. Naber	12. N. K. Nerikar
13. J. N. Pal	14. B. G. Gahilod
15. D. R Dhodapkar	16. K. R. Dubey
17. Y. B. Pandit	18. V. R. Deshpande
19. J. N. Kelkar	20. N. K. Ghosh
21. H. R. Pandit	22. L. R. Pandit
23 L. B. Khaitan	24. S. V. Bokarey
24. R. L. Gupta	26. K. S. Singha
27. R. N. Kher	28. B. N. Reddy
29. Md Abdul Rub	30. R. N. Antarkar
31. J. P. Lakhkar	32. N. A. Khan.

1st year Certificate

1. N. B. Pradhan	2. A. K. Chatterjee
3. D. V. Mahajan	4. G. S. Mooley
5. B. L. Verma	6. K. K. Pande

Intermediate (Agriculture.)

1st Class

1 A. N. Karnik	2 R. J. Kalamkar

2nd Class

3 A. S. Bakre,	4 Dharninath Das
5 K. N. Phadke	6 Mahendra Nath Shriwastao
7 Nakibazaman Ahmad	8 Parsharam Dube
9 S. K. Waishampayan	10 Madasir Ali

3rd Class

11 Babulal Kayastha	12 Balmukund Shriwastao
13 Mulchand Kayastha	14 N. K. Galande
15 S. T. Patil	16 Shamsundar Muchran
17 V. M. Panse	18 Wardarkar G. N.

The Law that the Farmers ought to know

S. B. Karkarey, M. A., LL. B.

The dirth of capital to a farmer is a great obstacle in the progress of agriculture. Efforts are everywhere being made to place capital within easy reach of an agriculturist. There are the cooperative societies, land and mortgage Banks, the Takavi and various other Institucions for offering loans. But easy and cheap capital is no small evil unless and until proper checks are placed on the farmer to prevent him from getting into debts over head and ears. Besides the fascilities enumerated above to a modern agriculturist, capital is also procurable readily from the various saokars who in fact were the only easily available bankers on the spot to the farmers. These people often struck an unlawful bargain, taking advantage of the dire necessity of their needy bretheren. The disease exists there still and must be rooted out. The greatest number of the litigants in the law courts are farmers and it is that class of people who ought to know some of the most important provisions of some of the very necessary laws of this country. The knowledge of the usury laws may help to a certain extent to eradicate the disease.

In India like other countries usury laws have existed for some time past. The earliest enactment relating to usury in India was the Regulating Act of 1774. That act applied to European British subjects in India and the maximum rate of interest fixed by that Act was 12 percent per annum. In course of time Regulations were passed for the Bengal, Madras and Bombay Presidencies fixing the maximum rate of interest at 12 percent per annum and this continued to be the legal rate of interest until the repeal of those Regulation by the Usury Laws Repeal Act of 1855.

The Usury Laws Repeal Act removed all restrictions on the rate of interest and required the courts to award interests at the rate agreed upon between the parties. The result was that the courts had to award interest at the stipulated rate, however exhorbitant the demand and however unconsciouable the bargain. The mischief which thus arose from the Act was remedied to a certain extent by amending section 16 of the contract Act 1872 and adding section 19 A in the Act. Those amendments had the effect of conferring upon the courts in India equitable jurisdiction in cases relating to usurious contracts in which the elements of undue influence was established. But where the

element of undue influence was absent, the courts had no power to grant relief to the borrowers however excessive the rate of interest might be. To remedy the evil was passed the usurious loan Act 1918.

The Act enables the courts to grant relief to borrowers in cases where the rate of interest is excessive and the transaction sued upon s substantially unfair. The Agriculturist therefore, where he feels that he has been duped by the creditor may plead in a suit brought-aginst him that the interest charged is excessive and the transaction is subsbantially unfair. In transactions of such a character, the courts have got a new jurisdiction. They may reopen the transaction, take an account between the parties and relieve the debtor of liability in respect of any excessive interest. They may also set aside either wholly or in part, or revise or alter any security given in respect of the loan but so as not to affect the rights of a bonafide transferee for value without notice.

In trying such cases where the above pleas have been raised the courts will take into consideration, the risk incurred by the creditor, the total remuneration derived by the creditor from the whole transaction, the financial position of the debtor and the presence or absence of security and the relation in which the creditor stood to the debtor and the necessities of the borrower.

The man who affirms that he has been charged excessive interest may show that there was sufficient security or that his financial position was good or that his previous transactions were regular. The debtor in such case may also show that the creditor had already charged for expenses, inquiries, fines, bonuses, premia or renewals. The borrower may further show that he was ignorant and that advantage was taken of him or that his necessities at the time were such that he had practically no free will and therefore the transaction is substautially unfair.

Under the circumstances mentioned above the court will hardly hesitate to relieve the borrower.

:o:

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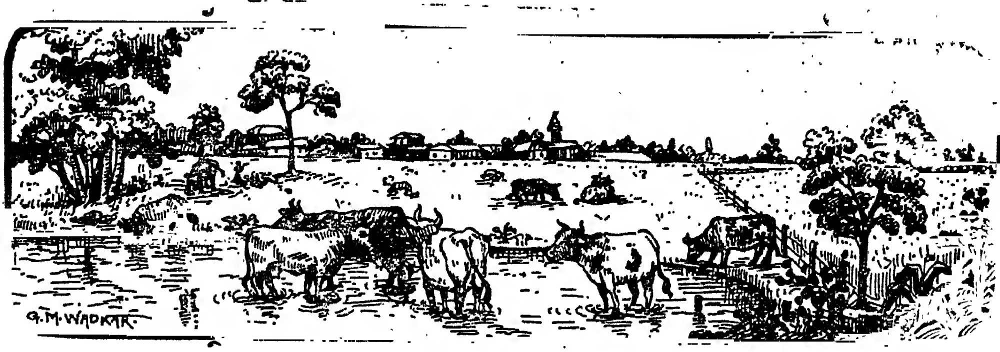


Make the country so attractive that even the prosperous farmer, no matter how rich he may become, will prefer to remain in the country rather than to move to town.

Vol. 2 **July 1927** *No. 1*

Editorial

THE prosperity of a nation depends largely on the work of those who till the soil. But the farmers themselves are dependant upon law and order, upon just, stable and strong government. If the government does not keep order so that peaceful citizens may enjoy the fruits of their industry they will have small encouragement. If the people have no confidence in the government, if they do not know when, by some high-handed act of tyranny, their earnings may be swept away, they will not be likely to work hard and accumulate wealth for their oppressors to enjoy. If the laws are unjust, and the worker is never certain that he will reap the just reward of his industry, enterprize and thrift, he will have little encouragement in the exercise of these economic virtues. If the monetary system is unstable and he does not know to-day

what his money will purchase to-morrow he will have a strong temptation to squander his money to-day while its purchasing power is good. In order that these and a multitude of other causes which hinder the prosperity of a nation, be removed, we need men, able to lead and help in the framing of such laws and the building of such institutions as will encourage all the workers to do their best both with hand and brain. We want men who will understand the nature of the work of the farmers, their interest, their hopes and their ambitions. We want agricultural statesmen who will specially understand the relation of a farmer to the soil, to other industries, to markets and to financial institutions of the world. This type of men can best be manufactured in the favourable atmosphere of the Colleges of Agriculture in India. If our students rightly utilized their time and realized their heavy responsibility, it is not too much to say that the future leaders, nation builders and agricultural statesmen, the Country will get from our institutions.

* * * *

The demise of Sir Gangaram, the veteran member on the Royal Commission of Agriculture removes an eminent personality from the agricultural and engineering spheres of India. He was the pioneer cultivator to adopt the improved ways of agriculture and set up an example of improved farming to the Punjab agriculturists. The manner, in which Sir Gangaram examined several witnesses that appeared before the Commission, reveals to us the spirit of the late knight. It appears his idea was to bring about a fusion of all that he found best in the western system of agriculture with all that is best in the Eastern system. His sudden death is a great loss to the Country. May his soul rest in peace.

* * * *

Sunk under the heavy load of indebtedness consequent upon the successive crop failures in the past years, the farmers of our province looked to the ensuing monsoon as their only hope. The monsoon started well and cheered the farmer. The month of July however brought an incessant downpour of rain amounting to about 25 inches with hardly any break. This prevented any cultu-

ral operations being carried out with the result that the plant growth was retarded by water-logging. The plants in the low lying areas and chopand soil were actually damaged. Though the rains have now ceased, the cloudy sky threatens the farmer every now and then. Those who can afford, may with profit, get their area under-drained. Anyhow the chances of betterment of our peasants seem uncertain this year as well.

* * * *

Gujerat and Kathiawar experienced recently the terrible reign of Deluge. Complete villages have been wiped out by the disastrous floods. Nearly 40,000 inhabitants have been stranded and rendered homeless. In Baroda—the city of palaces—for a time the city of silence–and the surrounding tracts, we are told, people were marooned for days and nights together on trees and tops of houses, the surrounding area being completely submerged under water 20 feet deep. Disorder, disease and misery reign supreme in the land. Let us sympathise with the people of Gujerat at this hour of their trial. The chance of sacrificing his all for the sake of his country and his people comes rarely to one out of a million, but every one of us can do his little bit for the poor suffering millions of Gujerat. India sympathised with the Belgiums, and Japanees not long ago. It is not too much to expect that the same kind hand of sympathy will be extended to our brethren in our own land.

* * * *

Town-life has lost its charm with the western countries. America, England, Africa and various European countries are taking definite steps to prevent exodus from the country to the towns. There are schemes set on foot to advocate, 'Back to the land movement.' Rural bias is being given to elementary education in England. Attempts are being made in America to so reconstruct villages as to make rural life more interesting and healthy than the city-life. With us, unemployment, overcrowding and other necessary evils, attendant on the city life have begun to make themselves felt only recently. Before it is too late, let us strive earnestly to create conditions in our villages which will prevent a rush to towns and cities.

The Tillage of Soil.

R. G. Allan, M. A. Principal, Agricultural College, Nagpur.

(Continued from the last issue.)

(c) *Fineness.*

THE farmer seeks to get a certain state of fineness in the soils of his seed-bed. The degree of fineness will be dependant on the soil, the crop and the season of sowing. Pulverization entails looseness of structure. This looseness and fineness are concerned primarily with aeration, moisture contents and adequate firming later, rather with the immediate needs of the roots.

A farmer desires to break up and separate the soil of his field so as to control its air and moisture and then later to reconsolidate this to the needs of the next crop. If a heavy soil is tilled when wet not only will its particles fail to separate out, but in drying they will form hard unyielding clods, unless reacted on by nature. The greatest care in respect to the danger of cultivation under this condition is called for towards the close of the rains. The process of pulverization of soil after its first inversion by the plough should be *from below upwards.* As far as possible the forces of nature should be allowed full play between ploughing and the next cultivation given the field. This results in cheaper cultivation costs and better results.

There is no fixed rule as to how long this period should last. Land ploughed in January may quite well be left otherwise untouched till the first rains. Land turned in September may demand cross cultivation within 24 hours. Soil pulverizes easily when it is just damp. In the first example, time must be left to allow of rain effecting this. In the second example, as the soil at that season may be over wet, time must be given to allow of partial drying out under the influence of the sun.

If the initial cultivation has been shallow, say 5 inches in depth, an implement like the disc harrow, in the early stages of the rains or a springtoothed harrow in land ploughed in the Monsoon, will be effective. The bakhar too can be safely worked after ploughing cf this character.

If the ploughing is deeper than the above, say 6 inches and over, in particular if an early monsoon seed-bed is desired, the next implements that may be used are a heavy cultivator or grubber or failing this a country plough which will work well down towards the bottom of the first ploughing and by its action fine down the crumbling clods and cause the crumb or fine soil to pass downwards while it brings the larger clods to the surface, and thus expose them to such further pulverization as may be desired. When the ploughing has been deep the very worst seed-bed for early sown "Kharif" crops will result if only a bakhar or disc harrow is used. The surface produced by either of these will be entirely deceptive and the seed sown therein on germination will find an uneven seed-bed full of hard clods and perforated with large air cavities.

Bakharing or discing a soil so ploughed, but not intended for sowing till July or later, is not so harmful, as in the meantime the wash of the rain will have caused the filling up of the most of the sub-surface cavities; but for early sowing on deeply ploughed land, effective cross cultivation with a toothed implement is essential before attempting to use one of more surface character. A great deal of the objection at times raised to ploughing before cotton, arises from a failure to appreciate the principle that for crops, specially if grown under humid conditions, cultivation must be from below upwards, each successive cultivation being shallower than the one before it.

Soil after its first secondary cultivation is roughly divided into crumb below and a greater or lesser thickness of clods and coarse crumb above.

How much the clod containing layer is to be reduced in thickness or depth by subsequent work, thus increasing the depth

of the crumb layer below, will depend partly on the depth at which the seed is to be sown and partly on the weather conditions likely to follow sowing.

The seed when planted must lie in a seed-bed, in other words, in a correctly prepared layer of crumb, sufficiently fine and sufficiently firm. So long as the seed is covered effectively, it does not much matter under humid conditions whether the surface is somewhat coarse or not.

If the seed is small it must be sown shallow, as for instance in the case of *tilli*; the crumb layer must come practically to the surface and pulverization, assisted by the weather must provide this.

If on the other hand, the seed is large, *tur or cotton* it can be sown one and a half inches deep. Under these circumstances fine pulverization to the surface is not necessary, as long as everything below one and half inches is satisfactory. Indeed under the conditions pertaining in the early rains which are quite different to those in October, a fine surface above the seed will, if any thing tell against it. At this season, more rain will follow shortly after sowing, often heavy rains. A soil which is rough and possesses surface clods leaves the rain some useful work to do, by breaking these down. A soil which has been left in a fine state right upto the surface, as is often the effect of the "bakhar" does not provide this outlet for energy of the rain and in consequence this energy is spent in beating flat and compressing the surface soil, so that it dries to hard crust which handicaps germination. The surface of a soil to be sown with a "Kharif" crop is best left therefore as coarse as the proper depth of sowing that crop will permit.

The reverse is the case in the preparation for a "rabi" crop. Assuming that the soil has been ploughed and cross cultivated in the monsoon and that the conditions at the end of the

rains are normal, the preparation of the seed-bed has followed the ordinary course and has been from below upwards and assisted by the weathering action of the rain, the actual bed is by that time prepared. The work which then follows the close of the rains under normal conditions has nothing whatsoever to do with the preparation of a seed-bed. Such post monsoon work is purely directed to protect the seed-bed zone and the lower soil from the loss of moisture. It must not therefore, be confounded with the final work on the surface soil of a " Kharif " bearing field.

It differs in two marked respects:—

(a) The work at this date is normally from above downwards the first cultivation at the close of the rains being shallower, so as to avoid the creation of hard puddled clods and subsequent work being deeper till the desired depth of mulch or loosened earth to check evaporation has been secured.

(b) Once this is done, the more often and the more rapidly this surface can be harrowed the better, because it is thereby made finer and therefore a more protective layer. At this season rain is unlikely and hence there is no need to guard against its compressing effects.

The making of a seed-bed for a " Rabi " crop after or near the close of the rains is only apparent if the opportunities for the pulverization and weed destruction during the rains have been defective.

In this case ploughing or cultivation to a depth greater than that required for the seed may be necessary and, as described under the section dealing with moisture, such tillage requires watching and the utilization of pressure to refirm the opened soil, before the final mulch or blanket of dry earth is provided by surface working. In a great deal of the cultivation commonly given by the aid of the bakhar for wheat in the black soil there is little or no prepa-

ration of any depth of seed-bed, when this is applied to the zone of the earth lying between the position of the seed and the unstirred subsurface soil below. The seed sown at nearly four inches below the surface is to all intents sown in the firm subsurface untilled soil and all the work in the rains and after has been devoted to the preparation of not a seed-bed but a mulch. It is only when primary work goes below four inches in depth that it can be said that a seed bed has been made to receive the seed of a Rabi crop.

In farm practice the pulverization of a soil has a number of additional functions which may be briefly mentioned. Without breaking up the soil, weeds cannot be drawn out, fertilizers and manures cannot be easily mixed, and seed cannot be drilled in uniformly and to a uniform depth or suitably covered. The difference in the seed rates found in different parts for the same crop as for instance in wheat, is largely due to the varying qualities of pulverization made possible by the climatic conditions during the monsoon of different tracts. A Berar farmer sows a field with 40 lbs, because by frequent cultivation made possible by the intermittant rain character of his monsoon, he has at sowing time a thoroughly pulverized soil. The cultivator in Hoshangabad uses 100 lbs, because lack of cultivation and pulverization finds him at sowing time with a rough and clod covered field.

(*d*) *Firmness.*

Aeration and firmness are opposite characters. The first is a primary step and is essential for sweetening but when completed, it must be followed by a restoration of such a consistency of soil as is favourable to root action, that is a suitable degree of firmness, in the layers of soil below the level of the seed, in the soil.

Plants do not thrive in a loose noncohesive state of soil. Farm crops need an aerated and somewhat firm rooting ground. Some call for firmer conditions than others. Firmness is necessary:—

(a) to provide a sound anchorage.

(b) to allow of a close contact of the feeding root hairs with the soil particles.

(c) to promote the effective movement of " film moisture ".

A loose seed-bed has also another disadvantage. It will subsequently settle, and the seeds and rootlets being lighter than the soil, are in consequence left near the surface and exposed to danger. In India as whole the heavy falls of rain associated with the monsoon tend to a natural firming and consolidation of the seed-bed. It is for instance almost impossible for a " rabi " seed-bed to be too loose, unless its preparation has been left or delayed to the close of the rains. In this case and again after late green manuring, it does become necessary to consolidate the bed artificially. Again crops sown in July usually secure a firm enough bed, though the writer has at times, experienced such light rains in June as to demand the use of a cultipacker to restore firmness for the seed bed of " Juari " sown on comparatively highly pulverized soil.

For the reason therefore, of the probability of the production of a sufficient natural consolidation by the earlier rains it is better to follow any deeper cultivation given so as to clean Kharif land, by a late sown "Kharif" crop, as for example Juari for grain rather than by any early sown crop like cotton.

One of the disadvantages of the sowing of cotton in a dry seed bed before the break of the rains, so as to secure the all important earliness of planting, lies in the looseness of such a bed and the danger of the undue settling of the soil and the subsequent exposure of the seed. If such dry sowing is done because of a delayed monsoon it is desirable (1) to artificially press the pulverized soil before sowing (2) to sow slightly deeper than would normally be the case where sowing is done after rain had been received.

This deeper sowing guards against the danger of soil settling and against premature germination before sufficient rain has been

received to guarantee continued growth, one of the chief speculations associated with this practice.

Natural firmness is always better than one created artificially as in the former, the process of firming is from below upwards, while in the latter, it is reversed. Again, correct cultivation from below upwards tends to an evener and better reconsolidation of the soil.

Economic Survey of Kachhi Estate.

R. N. Gadre, and D. Das Gupta.

(The writers have attempted to study the economic condition of the wet-land tenants of Nagpur with a view to redistribution of their holding to make it economic.—Editor.)

Preliminaries. THE Kachhi Estate is situated in Lendra-village bounded on the west side by the college dairy and on the South by the Ambazari-road. The soil is of black type, characteristic of this district and the land is fairly uniform throughout the area. The average rainfall of this place is about 46 inches.

Origin of the estate. This farm was established in 1882 with a view to teach the local kunbi-cultivators to use sewage to best advantage. Accordingly twelve cultivators of kachhi caste were brought from Cawnpore to proselytise the kunbi through their example. These men in the beginning were entertained as paid labourers on a very liberal salary. They proved exceedingly bad and were very idle and discontented. In September 1882, three of the most troublesome of the number were sent back to Cawnpore and the rest were induced on an arrangement under which their salary was reduced and in return of this, each was given 4 acres of land rent-free for nine months with the rights to use, free of charge, the manure stored in farm sewage pits. At the end of this period all

salary was to cease and the land was to be assessed to rent. This experiment proved to be highly successful; the crops they grew, were exceedingly good and gave them handsome profits. Their salary was then discontinued and they accepted 6 acres of land on a five-years lease at a progresive rent which was fixed at Rs. 5 per acre in the first and Rs. 15 in the fifth year. This was exclusive of water–rate which was charged seperately. This example of the kachhis had the desired effect on the local kunbis and some of them took land under similar conditions. Later on, there was great demand for more lands by the tenants and consequently land was distributed twice more but unfortunately care was not taken to see that each tenant got lands near his own holding.

The rent, afterwards, rose very high up to Rs 75 per acre including water-charge and manure costs. On the application of the kachhis for reduction of rent, the rent-rate was reduced but the free use of the sewage manure was stopped.

The average rent, at the present time varies from Rs 17 to Rs 20 per acre and all are now ordinary tenants on yearly basis. There are altogether 14 tenants and the total area cultivated is 27-24 acres. Of these people, Vithoba and Anandrao have got lands in the compact blocks as they were late applicants. Formerly they were given lands near Jail-road but as there was difficulty in water-supply they were given lands near other tenants.

Population.

The total population of the kachhis, as estimated from them is 67—of whom 28 are children and 39 adults Of the adult people only 23 work on the land while the rest include old males and females.

Lands.

The soil is black and fairly uniform throughout the area. The total area of wet land is 27·24 acres and the whole of it is either watered by well or by sewage water from Ambazari-tank. There is common waste for cattle grazing but cattle are mostly stalled as the grazing area is not sufficient for the village.

Water-supply. Water for irrigation is supplied from wells dug out by the tenants as the sewage water from Ambazari-tank is not sfficient nor available for the whole year. There are altogether twelve wells of which only one is kaccha and the rest are pacca wells.

Occupation of land There is total absence of sub-letting as all the owners are simply ordinary tenants of the Government college farm, on yearly basis. The rent is paid yearly in money. The following is the detailed list of holding of wet land.

	Area possessed	Number of Tenants
1.	under one acre	Nil.
2.	Between 1. 0 and 1. 5. acres	2
3.	,, 1. 5 and 2. 0. acres	6
4.	,, 2. 0 and 2. 5. acres	5
5.	,, 2. 5 and 3. 0. acres	Nil.
6.	,, 3. 0 and 4. 0. acres	1

Agriculture Agriculture, in fact, is the sole-industry of the kachhis. Of the total area cultivated 16·11 acres yield one crop and 11·13 acres yield two crops per annum. The principal crops and area cultivated under each are given below.

	Names of crops.	Area.
1.	Cabbage and Radish	9. 52
2.	Arum	6. 98
3.	Gourds	5. 18
4.	Methi and Corriander	3. 00
5.	Chilly and Brinjal	2. 65
6.	Maize	1. 15
7.	Sugar cane	0. 78
8.	Miscellaneous	9. 11

Cultivation. After harvesting of the crop, the land is bakhared once and stubbles, if any, removed. Afterwards before preparing the seed bed, two more bakherings are given. The tenants use also country *nagar* for primary cultivation depending on the kind of crop

and the condition of the land. For levelling and breaking clods they use the ordinary bakhar with blade turned upwards. They prepare seed-beds by manual labour and for long ridges and furrows they use the country plough with a crude form of mould-board like arrangement.

The following is the detailed account of the approximate cost of cultivation of one acre of wet-land having cabbage as the crop.

Cost of cultivation of one acre of wet-land.

	Rs.	As.	P.
4 Bakharings...	1	8	0
Ridging and preparation of beds	3	0	0
cost of seeds	12	0	0
Cost of raising seedlings	1	8	0
Cost of 25 cart-loads of F. Y. Manure... ...	50	0	0
Cost of transplanting	2	0	0
Weeding	2	8	0
Harvesting.	9	8	0
Rent.	20	0	0
Total	102 -	0 -	0

	Rs.	As.	P.
Estimated cost of yield per acre	...425	0	0
Net profit	...323	0	0

Rotation. There is no fixed rotation followed as the number of crops taken on any piece of land is not the same every year. Season, water-supply and kind of crop play an important role in taking any crop on the land.

Implements. Ploughs used are only of common country type and the people have not taken advantage of improved implements. Besides country *nagar* bakhars are of extensive use. Wells are worked with ordinary leather–mots.

Manuring. The chief and only manure used is the cattle-dung. Not less than 25 cart-loads are required for garden-lands per acre. Cattle-urine is utilized to a very slight extent jointly with cattle-dung but much is wasted as they do not pay any attention for the preservation of urine. The manure produced by them is of inferior type as no proper storage is done. Usually they are required to purchase extra cattle-manure as the amount produced by them is insufficient. Green-manuring is done in case of cane-crop and the chief crop used for green-manuring is sann-hemp. The kachhis fully understand the value of oil-cakes but the high price and want of capital stand in the way of its use. No chemical fertilizer is used by them.

Village. The area of the village site, taking only that portion occupied by houses etc. amounts to 4 or 5 acres as estimated by the kachhis. The dwellings of the people are tolerably good; there are only very few thatched houses and most houses have tiled roof with mud-walls. The maximum distance of any land from the home of the cultivators is not more than $1\frac{1}{8}$ to 2 furlongs.

There is no other subsidiary industry followed by the cultivators beyond the selling of milk.

Village trade. The chief item of trade is the sale of garden-crops like cabbage, arum, sugarcane etc. There is no idea of co-operative sale of produces amongst these people and each individual cultivator takes his produce to the market for sale even if it amounts to few seers only. Seeds and goods required for consumption are purchased locally. The situation of village is exceedingly good in reference to the markets and it is so nicely placed that it can command six local markets in a week.

Economic condition of the village. Wages are paid exclusively in money. The following is the list of current wages of agricultural labour.

Man......... -/8/- per day
Woman......... -/4/- per day
Boy.......... -/2/- per day

The current prices of stable food-stuffs are as given below:—

Wheat	11 lbs. per rupee.
Rice	10lbs. „ „
Jawar.............	15lbs. „ „
Tuwar.............	13lbs. „ „
Ghee.............	Rs 2/. per seer.
Sweet oil..........	Rs. ./12/.„ „

It is very difficult to estimate the number of people who have made savings as most of them are in debt, but not to a very large extent. Nevertheless they all look quite well off. There is none in the village who is not indebted to some extent to somebody and viewing their present position it may be said that prosperity and indebtedness go hand in hand. The causes of indebtedness are numerous, such as smallness of holding, cattle mortality, insecurity of harvest, fondness for litigations, improvidence and extravagance etc. The kachhis have got fair security of crops as they cultivate their lands intensively. These people do not seem to be very extravagant and the comparatively low standard of living is another check for running into debts; but the high price of food-stuffs and the increasing number in the family and the occasions like marriages compel them to borrow money.

The tenants, as they say, are fully occupied in their land throughout the year and thus there is no wastage of any labour days. They freely use hired labour as the home labour is not sufficient and this shows also that they are fairly well off.

There is no idea of " Co-operation " amongst these people in regard to credit, purchase or sale. The common saokar is the source of borrowing capital.

The following table shows the area possessed by each cultivator, the number of plots into which each holding is divided and the net profit obtained by each cultivator:—

No	Names of Cultivators.	Total area possessed	No. of plots	Area cultivated under		Price of Total yield	Total cost of cultivation.	Net Profit
				1 crop	2crops			
1	Nathu Budhu.	2.57	5	1.27	1.30	780-0-0	209-0-0	571-0-0
2	Chuni.	1.79	4	1.11	.68	586-0-0	146-0-0	440-0-0
3	Chhedi.	2.74	6	2.22	.52	486-0-0	150-0-0	336-0-0
4	Nanoo.	1.66	4	1.1	.56	446-0-0	142-0-0	304-0-0
5	Nathu Khansama.	1 8	5	.89	.91	576-0-0	127-0-0	449-0-0
6	Kanhya.	1.78	4	1.68	.1	234-0-0	103-0-0	131-0-0
7	Maiku.	2.66	5	1.51	1.15	778-0-0	178-0-0	600-0-0
8	Khushi.	1.78	5	1.49	.29	336-0-0	116-0-0	220-0-0
9	Itawari.	1.63	6	66	1.17	674-0-0	132-0-0	542-0-0
10	Jasoda.	1.73	4	1.00	.73	557-0-0	142-0-0	409-0-0
11	Gumani.	1.52	5	1.41	.11	202-0-0	97-0-0	105-0-0
12	Vithoba.	1 61	3	1 61	nil	144-0-0	54-0-0	90-0-0
13	Hemchand.	2.37	8	1.88	.49	518-0-0	149-0-0	369-0-0
14	Anandrao.	1.85	4	.54	1.31	378-0-0	137-0-0	241-0-0

From the above table it is apparent that the net profit derived from the holding mainly depends on taking two crops on the same lands. But this is mainly governed by the availability or otherwise of water-supply. But as Ambazari water-supply is neither sufficient nor available for irrigation in proper time, cultivators take recourse to digging wells. This is not, however, possible under the present circumstances, as the size of the holding is too small and particularly the fields of each holding are scattered and not in compact blocks.

Again a holding of about two acres, under present condition in a compact block irrigated from a well may be ample for the support of a cultivator of skill and enterprise but may be completely un-economic if scattered in five or six different places and sometimes irrigated from several wells in each of which the cultivator owns a fractional share or right. In most of the kachhis, the holdings have been sub-divided into numerous fields not contiguous but scattered throughout the area. In several cases the average area of fields does not exceed more than $\frac{1}{4}$ of an acre and of these some have become too small and narrow to plough crossways.

Further there is a dimunation in the efficiency of cultivator's labour as much of his time is wasted in going with his bullocks from plot to plot and further time is wasted in frequent turnings in ploughing a small plot; a further objection is that the fields are frequently too small to permit of a well being sunk with advantage. Proper supervision can, also, not be exercised in the present condition.

Apart from these there is a distinct loss of revenue to the Government owing to the present arrangement of the holdings.

Under such condition it is clear that many of these holdings at present uneconomic, would have their value greatly enhanced by such a grouping of the fields as would allot to each owner solid blocks of land. Though not free from difficulties such condition is being attempted in some places like the Punjab with some success through the agency of "special co-operative consolidation of holding societies"

An economic holding says Mr. Keating is a holding which allows a man a chance of producing sufficient to support himself and his family in reasonable comfort after paying his necessary expenses.

But it is impossible to fix accurately the size of such a holding for it is impossible to fix accurately what should be regarded as reasonable standard of comfort. Situation with regard to market, fertility and the uses to which cultivator can put are determining factors. It is not the area but the net product that determines what is an economic holding.

Taking all the above mentioned factors into consideration and studying the present state of the kachhi, we think, that owing to the proximity of market and the standard of living, the economic holding in this case can be about two acres and it is on this basis that the grouping of the scattered fields of the kachhi, in different blocks has been done. The land is fairly uniform throughout the area and the only question to be taken into consideration in grouping the fields is the situation of the wells. Hence

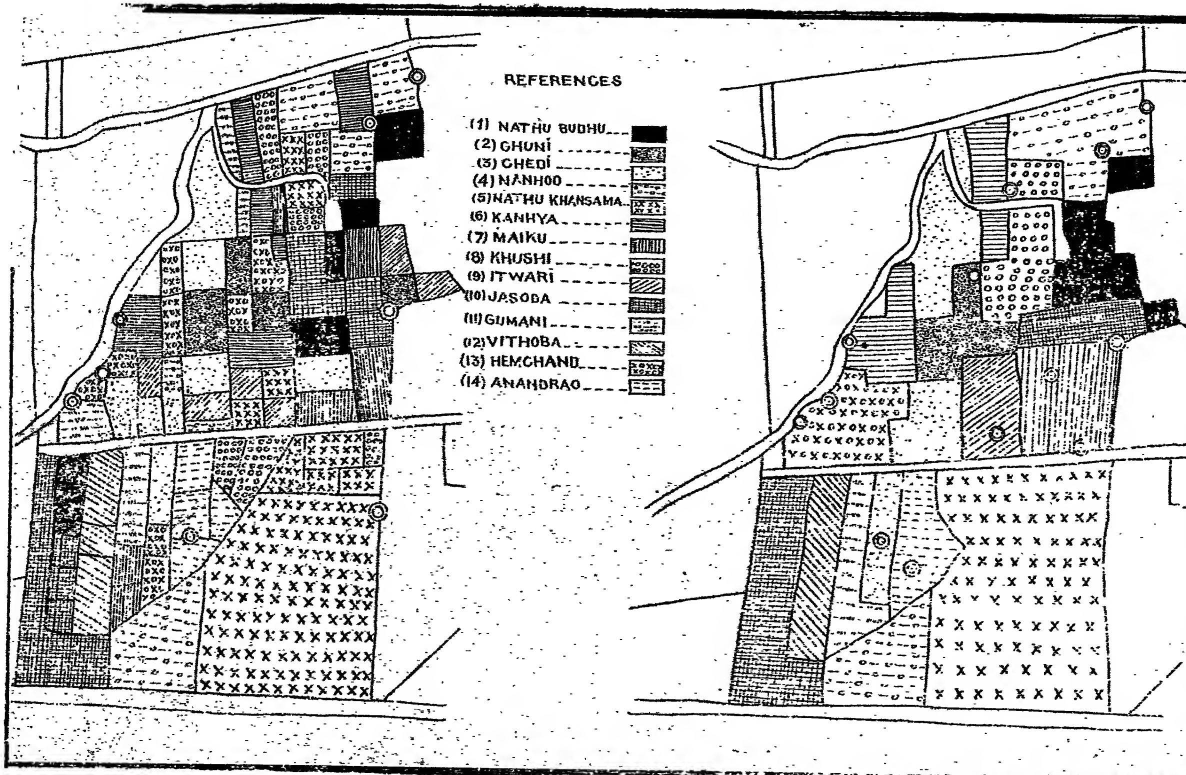
the scattered fields have been grouped into blocks in such a way that each cultivator gets his land near his well.

But in case of one cultivator named as Nathoo Budhu it has not been possible to stick rigidly to this rule and hence as a compensation he should be given the approximate cost of the well by the cultivator named as Maiku who will take his well in possession. (The annexed map shows the redistribution of the fields of each kachhi in different blocks.)

The following table also shows the condition of holdings after restripping has been done:—

NO	Name of cultivator.	Before redistribution		After redistribution	
		Area	Number of fields	Area	Number of blocks.
1	Nathu Budhu	2. 57	5	2. 72	2
2	Chuni.	1. 79	4	1. 72	1
3	Chedi.	2. 74	6	2. 70	2
4	Nahoo	1. 66	4	1. 66	1
5	Nathu Khansama	1. 80	5	1. 80	1
6	Kanhaya	1. 78	4	1. 81	2
7	Maiku.	2. 66	5	2. 66	1
8	Khusi.	1. 78	5	1. 85	1
9	Itawari.	1. 83	6	1. 86	1
10	Gumani.	1 73	4	1. 72	2
11	Vithoba.	1. 52	5	1. 52	1
12	Hemchand.	1. 61	3	1. 61	1
13	Anand rao.	2. 37	8	2. 37	1
14	Jasoda.	1. 85	4	1. 68	1

To sum up the result of this study, it may be said that though most of the kachhis are quite well-off even in the present condition of holdings being favourably placed to market situation, a great deal more can be achieved if their lands are restripped in the manner suggested before. The other essential requirement in enhancing the prosperity of the kachhis lies in "Co-operation." In the present condition a good deal of their labour and time is wasted in marketing the produce and the solution of this problem lies in the " Co-operative sale of the produce. "



(a) FIG I (b)

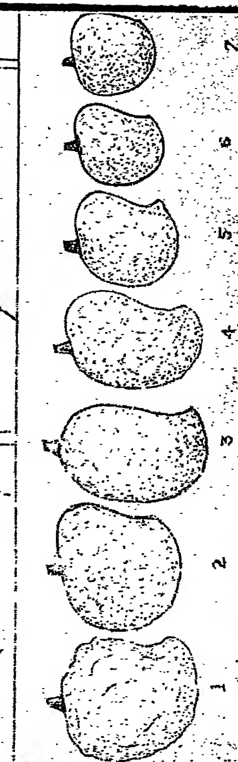


FIG II

Fig I (a) Condition of Kachhi fields before restripping

(b) Map showing Kachhifields after redistribution (P. P. 10-18)

Fig II Types of Mangoes (P. P. 19-21)

(1) Cowasji Patel (2) Malda (3) Sundersha (4) Nagin (5) Pairi (6) Badami (7) Sendri.

Mangoes

(*B. S. Rao, L. Ag. Hon.*)

MANGO trees are planted by some for pleasure in their home compounds while others plant them for profit or commercial purposes. In the former case the types selected for planting depend on the likings of the individuals concerned while in the latter, the types are determined by the market requirements and the distance of the market from the place of production. A very good type which may command a high price when sold fresh may not withstand a long journey and thus fetch no profit in a distant market.

Some types of mangoes are prolific yielders while others are shy bearers. Some types are very attractive in shape and colour while others are not fortunate in these respects. Some have a thick skin while others a big seed.

Tastes of people also for mangoes vary as widely as the difference in the mangoes themselves. For instance, a variety which bears the curious name of Cowasji Patel has been declared to be the worst type of mango ever tasted, by a large majority of the customers of the College Orchard. But a few simply fell in love with the above mentioned variety and desired to have more of the same. But unfortunately the rest of that type were generally plucked in a raw state and sold for preparation of jam (morabba) for which purpose it is excellently suited.

In this article, I propose to describe the fruits of the various types of mangoes reared in the College Orchard so that persons who are prospective mango growers may pick out those varieties which combine the qualities they want.

Nagin These are not prolific producers. The fruit has a light green colour even after ripening. Of all the varieties described in this article this has the best flavour. The skin is thick and cannot be removed with a knife due to the presence of a layer of fibrous matter below

the skin. The flesh is orange red in colour. The seed is flat and at the tip end has depression on either side. The fruits lack in keeping quality. Taste is sweet.

Pyari A prolific variety. The colour varies. Some are uniformly yellow; others have a bright red colouration near the stalk end. The skin emits a smell which is inviting even from a distance. As in the case of Nagin it is difficult to remove the skin with a knife. The flesh is yellow and has no flavour. If not allowed to ripen on the tree for a long time it tastes sour. Of all the Varieties we have, this is the one which deteriorates soonest during storage. The seed is nos flat but slightly oval.

Badami Also known as Apoos or Alphanso. A shy bearer. Colour of fruit greenish yellow. The skin is fairly thin and can be removed with a knife leaving solid flesh in tact. The skin does not give out any smell. The flesh is red and sweet. The flavour which is really very good is second only to Nagin. The keeping quality is very much superior to those described above.

Sundersha Also known as Totapari because of the fruit resembling the beak of a parrot in shape. The fruits are long and slightly flat. Even in the raw state they are sweet. The trees bear heavily. The fruits take a long time to mature. They possess very good keeping quality and hence large quantities are sent to these parts from Madras and Bombay. The flesh is straw coloured and is devoid of any flavour and special taste. The skin is thick. The seed is flat and long and has depression on either side of the stalk end.

Malda Also known as Malgoa. The fruits are round and the tip is least prominent. Neither the shape nor the colour is attractive. The fruits take a long time to ripen. The fruits of Malda are very big. They are sour when raw. The flesh of a ripe fruit is almost white. The skin is thin and can be removed with a knife. In a ripe fruit the

skin shrinks (in to folds) slightly. Malgoa furnishes the maximum weight of edible stuff. The flavour is not anything very special. Keeping quality is fairly good.

Sendri This is the smallest of the varieties we have, but I should consider the best of all of them. The fruits of this variety combine many good qualities in them. They are of good shape, very attractive colour, excellent taste and good keeping quality. The skin which is very thin can be removed with a knife like that of an apple. We have at present only one tree of the type. All our customers who tasted the fruits of this tree have been immensely pleased and there is a great demand for grafts from this tree.

Cowsji Patel The fruits of this type are the biggest of the mangoes we have. The shape is ugly as the protruberances on the fruit give it an appearance of a Sumom. The fruits are useless when ripe as there is some bitter taste and peculiar sensation created in the throat. The raw fruits however are very well suited for the preparation of jam (Morabba).

In conclusion I have to offer my thanks to my friends and customers for giving their opinion about the taste of the various fruits.

Table showing the weight of fruits, skin, seed etc. of the types of mangoes described above.

Type.	Average weight of selected fruits in grammes	Maximum weight recorded this year in grammes	Average weight of skin in grammes	Percentage of skin to fruit	Average weight of seed in grammes	Percentage of seed to fruits	Average weight of edible stuff in grammes	Percentage of edible stuff to fruits
Nagin	279	299	59.0	21.1	41.5	14.7	178.5	64.2
Pyari	256	282	41.0	17.6	46	19.7	146	63.0
Badami	285	297	37.5	12.8	45	15.8	202.5	70.8
Sundersha	271	284	54.5	20.1	45.7	16.8	170.8	63.0
Malda	460	520	62.0	13.4	62.0	13.4	336	73.0
Sendri	130	135	9.2	7.0	32.0	24.6	88.8	68.3
Cowsji Patel	420	560	89	21.1	52.0	12.3	279	66.6

Value of Science in farming

(*R. B. Ekbote, IVth year*)

FOR a great part of it provided with priceless heritage of soil and climate suitable for agriculture, India is eminently an agricultural country. Agriculture has been the profession of more than 70 % of her inhabitants handed down from father to son from times immemorial. The advance of India as a nation is a possibility only after the proper development of this important industry. It is a wonder that India a pioneer country in agriculture, should remain behind the other countries in the very industry. Progress in agriculture in the western countries has marched with a pace that would stagger imagination. Yield there has increased one and half times. Cultivation has much improved. Effective machinery has been evolved, production intensified and above all production per unit of capital is comparatively cheaper.

The close study of the western agricultural advance reveals one fact that 'science' has played the principal part in its development. The study of agriculture has been pursued on scientific basis. The knowledge of allied sciences viz. Chemistry, Botany and Zoology etc. has been brought to bear on agriculture. Researches have been undertaken. Experimental work is continued. In short the western nations have rightly understood the relation of science to agriculture.

We have neglected the very thing. We have not called science to the aid of our agriculture and even now research and experimentation are looked as drains on public money. The fact that both the farmer tilling his soil with those ways and implements evolved out from the accumulated experience of hit and miss and the scientist engrossed in his work on seed and soil, milk and milkmicrobes, flora and fauna are in the direction of more and better production has so far been completely ignored. Our farming is still based on a rule

of thumb established by experience of past ages. The methods adopted by a farmer in India are really the result of experience obtained and not by reguler scientific methods but suggested by chance.

Of late however our agriculture has felt the touch of science and the results of the scientific work have filtered to the smallest cultivator and the result is encouraging. Thus we have struck the right path and ere long our farming will reap the benifits derived from scientific methods applied to the development of agriculture provided we encourage the research and investigation work.

In the following lines it will be the endeavour of the writer to bring to the notice of the readers some of the benefits our farmer has derived as a result of scientific enquiry applied to the improvement of our agriculture.

The whole business of agriculture depends primarily on plant and soil. The soil is studied from chemical, physical and biological points of view. The writer believes that the physical side of the study which embraces the structure, texture etc. has been well understood by the farmer due to his long standing experience. He has a fair knowledge as to what crop his soil is suited for. He knows whether his soil is light or heavy drained or otherwise *Kali or Birdy* etc. But the contents of his soil, the requirements of plants, proper ways of supplementing the ptant-food in the soil in proper quantities is hardly known to him. This is due to his lack of knowledge of the chemical composition of his soil. He knows only that manuring increases the yield and at the same time is not aware what elements his soil is deficient in and whether he is really adding these to the soil by manuring with cattle dung in required amounts and at a less cost.

The chemical knowledge of his soil helps him here. This knowledge tells him, what are the elements his soil is rich and deficient in. The scientist after a regular study of the soils of different tracts found out the chemical composition and they know the merits and deficiencies of the different soils in this respect. He

has analysed the cattle manure, oil cakes etc, and knows what elements are added by manuring the soil with these. He made then a comparative study of the varieties of natural and artificial manures and ascertained which of them would enrich a particular soil cheaply and readily. This scientific study has been of a great use to our farmer as will be clear in the following example.

In this connection a Berar farmer be taken as our example. The farmer collects the excreta of his cattle and throws it on to his field. In majority of the cases the amount of manure produced by the animals is sufficient hardly for one third of the area of the owner. Thus two-third of the area remains unmanured but constantly cropped with the result that it gets impoverished from year to year. He has hardly tried to supplement this by other fertilizers. This is due to the lack of his knowledge about these. The scientist helped him here. His experiments on manuring cotton the staple crop grown in Berar were of much use in practical farming. He investigated that nitrogen is the chief element the cotton plant suffers from. He knew that cattle manure is scarce in Berar. He therefore hit upon other artificial manures and tried them all. His experiments on sodium nitratate and ammonium sulphate proved that they could be best used as supplementary dressing to such amount of cattle manure; more-over he found that these salts add nitrogen in a more readily available form. He therefore recommended sodium nitrate particularly (along) with other nitrogenous salts to the cultivators to use them, to supplement the light dressing of farmyard manure for cotton. That Sodium nitrate can be applied at a profit is evident from the following table.

Treatment	Average lbs. of *kapas* per acre	Net profit due to manure in Rupees.
No manure	333	nil.
64 mds. of cattle dung + 10 lbs of nitrogen as sodium nitrate.	649	38-5-0.
32 mds. of cattle dung + 20 lbs of nitrogen as sodium nitrate.	516	25-8-0.

The results have shown that 10lbs. of nitrogen as sodium ni-trate in conjunction with 64 mds of cattledung pays most. That is, the farmer who has practised this way of manuring his soil has reaped ~~Rs~~ 38-5-0 as the profit over one acre of his area as compar-ed to that over unmanured area.

Another good example of the benefits the farmer received from the chemical and physical knowledge of his soil can be cited from Chattis-garh tract. The *Bhata* soil in this tract is light and poor. Rice of ordinary quality is the only hope of the owners. Cotton cul-tivation on these lands was considered an impossibility by all. The study of this soil revealed the wonderful capacity of it for growing a long stapled cotton which was adversely affected at other places in those provinces by the unsuited climate and soil with the result that a number of farmers have readily taken to its cultivation and have added large amounts to their pockets.

The cultivators hardly know that there are unseen creatures living in the soil. Their importance to them is therefore naturally lost sight of. Of the many organisms present in the soil besides those present in the root noduls the Azotobacter is concerned in the nitrogen fixation. These organisms derive their energy from organic matter in the soil and require a constant supply of oxygen. The addition of organic matters in the soil and frequent stirring the surface to aerate it would mean the manufacture of combined nitro-gen and this would dispense with any nitroginous manure under ordinary conditions. Secondly, the bacteriological study reveals that leguminous plant roots have nodules containing the bacteria which can use the free nitrogen of the atmosphere and make it available for the plant. The value of growing leguminous plants in rotation lies in this that they would add nitrogen to the soil which can be useful for the following crops. The following table would confirm the above remark.

Crop	Average net profit per acre in Rupees.
Cotton, Tur, Jawar	20-7-0
Cotton, Gram	25-12-0
Cotton, Tur	30-14-0

This way of rotation, that is cotton following legume, gives the highest profit and those cultivators who have followed this course of rotation have been required to give less manure to cotton which means a saving of some manure.

Let us now turn our attention to other branch of science viz. Botany and know how far the application of that branch of science has helped our brother-farmers.

Selection of good seed for sowing is paid only a little attention to by our farmers. There is no rigid selection of each seed as to its purity, quality etc. Pure seed is therefore an exception and mixtures are the rule.

The scientists have made a botanical study of all crops grown in this country. They have analysed the mixtures and isolated the different varieties. Each of these is grown separately and the quality and quantity of its product ascertained. The varieties that answered our demand viz. more and better yield are tried on field conditions and on the successful results have been introduced to the farmers. Seed distribution was undertaken. Seed depots and unions started. Along with this work mass and plant selections were undertaken to aim at a higher quality. These two works form the stepping stone for the improvement of varieties of crops. The purity of seeds and selection has enormously increased the output. It is not possible to show the results in each crop in this short paper, only cotton and wheat are taken as examples.

The following table would translate the above statement in facts and figures and show that the isolated varieties yield and pay more than the mixtures.

Variety.	Ginning o/o	Average outturn. of lint per acre	Value of lint at the time
Berar jari (mix ture of neglectuma)	34	158	Rs. 69
Rosium	40	214	,, 93
Malvensis	32	138	,, 66
Cutchika	38	201	,, 87

The botanical examination of Indian wheat led to the selection of a number of wheats viz. Pusa 12 Pusa 4 Punjab 11 which are now grown over a million of acres. The increased profit to the grower due to these is at least Rs 15 per acre.

The further step that is taken in the application of botanical science to agriculture is "Hybridization". In order to improve the existing varieties from the point of view of quality and quantity the unit species are crossed to bring about a desirable combination.

Cotton and wheat be taken as examples.

The quality of cotton grown in this Province is rough and short stapled with the result that it attracts the least demand which means low price. The burning problem before the Botanist is therefore to improve its quality and staple. It has been found that the exotic varieties do not thrive in the soil and climate of our Province. The only alternative then left is to cross the rough varieties with the finer ones. The object of this work of hybridization is to fix all useful characteres viz. more yield, high quality, long staple, more ginning percentage and above all the adaptability of such a strain to our soil and climatic conditions. The efforts are launched in this direction and the work continued. Some strains are evolved and are undergoing trials and the efforts of Cotton Committee if crowned with success, are sure to be beneficial.

In the case of wheat the types produced by the Research Institute Pusa are grown over 2,000,000 acres. The total area under improved varieties of wheat produced during the present century

must be little short of 25 million acres. At a moderate estimate the increased wealth produced by the application of modern methods of plant breeding to this crop must be at 20,000,000 sterling a year.

The improvement of cattle both for milk and power, advance made in feeding of animals, the wastage of crops due to disease that has been minimised by the application of science of mycology and entomology are the vivid examples that show what science has done to improve our agriculture.

The writer has attempted in this short paper the utility of only a few branches of science to agriculture but it will go a long way in proving the importance of scientific investigation in all its various branches for further improvement of agricultural industry and adding to the nation's wealth and producing power.

Evolution of the plough,

(*Kartar Singh Cheema, L. Ag. A. E., Mech. E.*)

The most essential operation in agriculture is that of ploughing the land and its subsequent cultivation. The fundamental implement used, the plough, may strictly be classed among the wonderful things of the world. The history shows that the ancient Egyptions and the early biblical writers were well acquainted with its use. It is evident from the various records that the prosperity of the people and the plough have progressed side by side. At first ploughs were of a crude type, the most primitive being entirely made of wood. Many centuries before the christian era, Persians used wrought iron plow shares or points. During those unsettled days it was an ordinary practice of ploughing one year and fighting the next, so that the plough points were immediately beaten into swords and spears, only to be converted

again into shares when the war had come to an end. The Romans during their long occupation of four centuries are said to have introduced and used the wheel removable mould-board of the plough.

First improvement.

In the year 1730, the Dutch were the first people to bring out a more satisfactory design of plough than the crude type of Romans. In fact up till 1785, plough shares were made in wrought iron but in that year a patented process of making and hardening shares in cast iron was introduced to be followed in the year 1803 by a method, Ransomes patent, by which the lower sides of the cast iron shares were chilled. This process permitted the upper soft side of the share to be worn away at a quicker rate leaving the lower chilled edge always projecting and sharp enough. The year 1808, witnessed a further and notable advance in the design of the plough, which till then was not constructed in a manner as to facilitate the easy replacement of parts. The new designs introduced, soon became popular.

Degrees of Development.

The original structure of the early days, sprouted from the branch of a tree. The plough has developed through the ages to the present-day types by definite stages, that is first by the fitting of a metal point or share, then the addition of a wooden breast which served to turn over the furrow slice. In the course of time, this wooden breast was prepared with the covering of an iron sheeting to prolong its life. At the end of eighteenth century solid metal breasts began to be fitted, which were sometimes made of cast iron and in other cases of wrought-iron. These improvements were followed as already stated, by the fitting of improved shares and by better method of assembly. In modern ploughs high carbon steel forms the major portion in their manufacture and is especially needed for more strenuous ploughing conditions. Drop forging and malleable cast-iron is also mostly employed.

Different types.

Modern ploughs are designed in a great variety of types suitable to be hauled by bullocks, others by mechanical power. Different classes of work, such as ordinary ploughing, ridging, sub-soiling, draining, brush breaking etc. have their form modified to the respective needs. Increase of draught in sticky soils owing to bad scouring is now being reduced by supplying with breasts of harder special steel having highly polished glass surface. Such mould boards turn over a clean furrow slice. Another novelty in the manufacture of ploughs is the substitution of breast, share and land side plate into a large concave steel disc, which is set at an angle to the line of travel, turns a furrow outward when the plough is drawn forward.

Flood-proof Fencing

In areas subject to flood, a common phenomenon has been the complete ruin of the fixed wire. The details of the flood proof fences are as follows:—Posts 33 feet apart. Intermediate woodposts or " droppers " which do not enter the ground, are set up one right up against each main post and the two between the latter and the next main post. The main posts are 6 feet long buried to a depth of 2 feet 6 inches and bored close to ground level to allow the bottom wire of the fence to pass through. The droppers are 3 feet 10 inches long and are bored for 5 of the wire stands at 4 " from the bottom and then at distances of 6 " , 5 " 8 " and 11 " between strands, while the last strand, which is of barbed wire, rests on the side dropper and is tied through the whole with tie wire. The lowest strand of wire is reeved through the main post. Each dropper near a post is fastened to the post by a loop af galvanized wire passing through the post and tied so as to give way in flood time. So allowing the whole fence including the droppers to fall flat. The fence then lies on the ground and allows the water and debris to pass clear over without doing great damage, being itself tithered by the lowest wire, which is passed through the main post and so holds the fence in position.

The fence is naturally erected on the side of the main post furthest from the flood source. This type of fence has already proved very useful in New South Wales.

(I. R. of S. and P. of Agriculture)

Central wire bracing for Fruit-trees

MANY and varied are the methods adopted by the fruit grower as a means of preventing the breaking of limbs of fruit trees during years of heavy crops. On a plot of land in California numerous tree bracing methods have been tested and the central wire brace appeared to be superior to the other methods in the plot. Fourteen men, a total weight of 2000 lbs hung from limbs of a central braced tree and no part of the system broke. This system is being adopted by most fruit growers in California.

The tree is braced from within by means of wire, each limb being supported by a wire, one end of which is attached to the inside of the limb by means of a screw eye or staple. The other ends of the wires come together in the centre of the tree where they are attached to a single ring at the proper height.

A screw eye or staple is inserted on the inner side of each of the main limbs at the proper height; if placed too high on the limbs there is a tendency to pull the branches. Placed too low the branches are liable to break above the supporting wire. An awl is handiest tool for making a hole in the limb. The screw eye should be screwed into the limb until the lower side of it, is touching and is parallel to the limb. When using the staple it also should be left parallel, eleminating the possibility of preventing the sap flow and speeding up the callusing over of the staple or screw eye, thereby making the straining power stronger.

After the screw eye is in position, one end of a wire is inserted through the eye and the figure-eight is used to prevent stipping or pulling out from the screw eye. After trying, the wire is drawn to the centre of the tree and is cut the desired length; the same operation of wire is repeated on the opposite limb of the tree. A harness ring 12 inch or metal washer is then secured to the end of the wire which has been attached to the screw eye on the first limb. With this ring or washer, in one hand, the loose end of the second wire is then directed through the ring or washer, pulled tight, and twisted securely, the figure eight tie being used. The wires should not be pulled too tight nor left too loose. The ridge is then found to be suspended in the centre of the tree and the wires from the other limbs are then drawn up through the ring. With old trees which have long whippy limbs it is advisable to use two wires one higher and one lower than would be used when only using one wire.

The best time of the year to brace trees is when they are in the dormant stage as the operator can see better and there is not the possibility of destroying foliage or fruit. Screw eyes should be used on young trees as

there is the possibility of splitting limbs. When using staples for convenient work the ladder should be set up in the centre of the tree. Staples can be inserted quicker than Screw eyes and should be driven in as far as possible thus allowing the wounds to heal sooner.

This method is practically permanent and helps to give the tree an attractive shape and appearance; the strain on one limb is supported by all limbs, and the brace does not interfere with harvesting or pruning. One man should brace twenty to thirty full bearing trees per day at a cost of about 1 shilling per tree for material.

Ladders, hammer, plier, staples or screw eyes of various sizes, and 1½ inch iron harness ring or washer, and galvanized wire are the only materials necessary to perform this operation.

* * * *

Weeds, like all other plants, absorb moisture from the ground. In badly infested lands the water taken from the soil may represent several inches of rainfall which would have remained in the soil for the use of the crop at a critical period.

Remember weeds cut down your yield, damage your crops, cheapen your product, reduce your profits, rob the soil, injure your stock and reduce the value of your farm (A. S. of N. S. W.)

* * * *

A writer describes a simple process of training vines on posts without wire. He cuts the wire in goblet form and trains the branches in lines, half to the right and half to the left. The branches of two adjacent vines are inte-laced so as to form an arch. Thus a continuous avenue of vines is formed through which the necessary tools may be easily carried and at the same time the application of sulphur and sulphate of copper is faciliated and also the vintage work. The vines ripen with greater regularity and those so trained are less exposed to the effects of humidity than when simply cut in the goblet form. By this method also a considerable saving in wire netting is effected.

* * * *

Out of the mouths of Practical Industrialists.

Female labour if properly organized is superior to that of the opposite sex. In the first place stability is the important merit of the workers of the fairer sex. Honesty and sincerity of purpose are the next merits of women workers. As they seldom require goading on their management is light.

* * * *

To produce the best quality is the most effective way of advertising.

* * * *

In daily work of a routine kind it is ability to work according to direction rather than the possession of wisdom to direct that is required and in most cases the employers are in need of servants and not teachers.

* * * *

Most of our educated men have yet to appreciate that every calling is honourable except the calling of idleness.

* * * *

Before we spend public money on new technical schools, or before we award scholarships for technical study in foreign land, we must make sure that at least a large percentage of those who will become qualified in this manner will get some work when they are ready to take it up. The experts can not start industries and a super abundance of experts who have no work has done no good to any country.

* * * *

One of the most important and the least noticed causes of inefficiency of labour is the lack of efficiency of the supervising staff.

* * * *

An excellent aid to efficiency of labour is education and that is the reason why in almost every western country, primary education has been made free and compulsory.

NAGPUR

Agricultural College Magazine

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Contents.

The Eighth International Dairy Congress 1928.

THE Eighth International Dairy Congress will be held in Great Britain in July 1928 under the gracious patronage of His Majesty the King Emperor.

Like the Seven previous Congresses the forthcoming Congress will further the cause of International harmony, the development of all the sections of the dairy industry and public health.

The sessions of the Congress will be held in London, Reading, Edinborough and Belfast, and excursion to places of interest in the British Isles will be arranged with a view to present a comprehensive survey of the organization and methods of the milk industry in the country.

The Annual show at Nottingham of the Royal Agricultural Society of England to be held during the period of the Congress will also afford an opportunity of seeing the finest examples of dairy cattle and dairying in all its aspects.

The General Committee cordially invites all Producers, Consumers, Distributors of milk, scientists, Physicians, Health administrators, welfare workers and philanthropists. Those interested can obtain further information from:—

The Director of Industries,
Central Provinces, Nagpur.

or The Organising Secretary, The World's Dairy Congress, 1928
28, Russell Square London W. C., I. England.

Agricultural College Magazine.

Great men make us think better of our kind and more hopeful for it.

Vol. 2 **October 1927** *No. 2*

Editorial

Old Collegians.

While the improvement in quality and get up in the Magazine is attracting subscribers and contributors from out side, it is disappointing to find that the old collegians are still holding themselves aloof with apathetic indifference. Sir, you are debtor to your profession. You are indebted to it for the intellectual benefit which you derive from the concentration of powers. The traditions of this honourable profession have furnished you with intellectual and moral stimulus. This calling has afforded you opportunities of public usefulness. It has provided you with the means of gratifying social and other ambitions. It has been the field that has enlarged your experience and secured for you comradeship of a specially valuable kind.

It is up to you to repay these debts. You can do so by raising the level of the profession, its ideals, in its practical results and in its standard of equipment. The magazine is one of those inportant agencies which help to raise the level of our profession. Will you not help the onward march of this young journal ?

* * *

Things that Count for success.

Tact, combined with self confidence, ability to judge between men, a cool head, resourceful readiness to meet situations, courage to give up the most cherished opinions and scheams when found erroneous,a patient and tolerant attitude towards criticism and a generous nature ready to forget and forgive, are the qualities that characterize common sense. It is the man with common sense that succeeds. Another essential requisite to success is business honesty. Straight forward methods pay in the long run in every walk of life and they certainly do in business. The British business man has established a high reputation for clean methods all over the world, with the result that Great Britain commands today the largest foreign trade of any other civilsed country. Every patriotic Indian should see that his country is second to none in this particular respect. ' The world always pays for ability in the coin of the realm and talent always attracts financial recognition.' If you wish to hold your present position or to climb to a higher one, you must make yourself 'more fit than your associates and competitors.'

* * * * *

Military Education.

The percentage of literacy, the number of civilised minds, and the volume of amassed wealth are not the terms in which the strength and stability of a nation or a country is measured. It is the degree of strength to ward offt he foreign attacks, the army, the number of people trained in the military that are the true and real reflection of the strength and capabilities of a nation or a

country. It goes without saying that a farmer who looks for a luxuriant harvest, has of necessity to undertake every possible precautionary measure by way of protection against the damage of his crops before he sows it. Equally is true of a nation like India which toils and moils to establish responsible. self-government among the mighty nations of the world. It is therefore of necessity to take every means of protection for the stability and smooth administration. What is her defence today? The microscopic percentage of Indians in the army. What is the number of Indians that have seen Sandhurst College ? The statistics would disappoint us. In the face of such circumstances it is the duty of every Indian to strain every nerve to see that ever increasing number is trained in military Colleges, and is admitted more and more into the army. We strongly press the idea of establisting a well equipped military College in India where a constantly flowing stream of students would come to be trained and admitted into the army, navy and in aerial departments. In addition we earnestly desire that every school and college be provided with a little staff to train the boys in a way that would send him after his educatin with a military spirit. In this connection, we are indebted to our Nagpur politicians for having knocked the doors of Imperial Legislature for military education. It is long since that rumours are afloat that the Nagpur University is seriously thinking of starting a University corps. We wish, it will not be long when the university students will have to wear khaki dress and join the ranks.

Students and Politics

Politics in India at present has become wildly confused. There is hardly any thing that can rightly be called Indian politics. India has got Hindoo and Muhammadan politics which far from evolving a united Indian nation for working out its own salvation has unfortunately launched into a sort of civil warfare which aims at the most pernicious project of exterminating one another. Indian atmosphere has become vicious and awfully dark by the dust raised by the

prowling communal and the so called political heroes of the two warring communities, and the vision of many have been blurred by the dust raised, but we students of to day, the citizens of tomorrow, the future of hope of the unfortunate mother, in the prime our life should not lose our way in this hopeless, and enormous confusion but tread the path of the good and do our best to fructify the sweet dreams of the great Indian thinking minds dead and living. We the sons and daughters of India should pity, those misguided and unfortunate masses, who are breaking the heads of each other, their own fellow brethren with whom they are to pass their times, out of sheer ignorance. Our Duty is to hold up the banner of truth and ideal at the face of enormous encircling odds, and not to fall victim to any sort of bias, social, political or religious. Our mission in life should be to carry the torch of light in the enveloping darkness and help the poor and the distressed, raise the fallen and ameliorate the conditions of suffering humanity to the best of our ability and in short we should be blessing to our country, nation, and humanity.

The Tillage of Soil.

R. G. Allan, M. A. Principal, Agricultural College, Nagpur.

(Continued from the last issue.)

The influence of Soil on Tillage Practices.

HEAVY soils though possessing certain characters which make them invaluable as farming assets under the conditions under which many crops grow in India, suffer from two distinct defects,

(a) a seed-bed is more difficult to attain, as the fine texture and the greater percentage of clay tend to cause the particles to adhere to each other thus offering a greater resistence to the passage of implements, a greater tendency to the formation of unyeilding clods and a greater danger of puddling, if worked when perchance too wet.

(b) The percolation of water into the subsoil is apt to be slow especially in the early part of the monsoon and they are on this account more subject to erosion.

Heavy soils in short cost more to till and demand a greater skill in management.

The essential object to be attained in the cultivation of the heavier classes of soil is openness, thus stimulating aeration and water percolation. Such soils benefit by deep initial cultivation and by types of later cultivation which will counteract their natural tendency to compactness and to run together under the influence of heavy rain.

Light soils rarely require more than 5" to 6" depth of initial cultivation, while heavy soils, provided that other economic factors do not intervene benefit by being ploughed 7" to 8" in depth. This may be said to be invariably the case on the heavier and lower

lying soils usually devoted to "rabi" crops. In the case of "kharif" sowings other economic factors prevent this being a practice which can be advised annually, but even in this case a depth of at any rate 7" should be attained once in three to four years.

On the lighter types of soil subsequent cultivation, though in some degree utilized to mix, fine down and aerate frequently and unless heavy rain intervenes, always entails some process tending to compact the soil. Taking into consideration the shallower ploughing here used, the bakhar, the disc harrow and the spring toothed harrow may all be safely used, but, unless good rain falls and thus tends to compact the seed-bed, some implement which exerts pressure a roller, a cultipacker or the more rudimentary planker or log is necessary.

Secondary cultivation on heavier soils in particular is to some extent influenced by the depth given in the primary work and on the condition of the soil at the time of working. Given that 7" to 8" ploughing has been indulged in and that the necessary time has elapsed to allow of the free play of weathering agents, which are of extreme importance in the economic and adequate handling of soils of the heavier class, an implement which provides a stirring and uplifting effect, as for instance a heavy tyned cultivator, set to lift the clods up, or a country plough, worked at right angles to the initial tillage is the best tool. Subsequent to this the disc harrow or "bakhar" may be used.

Where ploughing has been only a matter of 5" to 6" or less on such soils, the heavy cultivator can be dispensed with and a disc harrow, set to work deep, or a heavy "bakhar" or better the new bar pointed "bakhar" can follow the plough once the weather has allowed of the partial disintegration of the plough furrows.

It is important however to remember that, when ploughing has been of deeper character and in particular, if early sowing after the break of the rain is desired, the use of an implement of the cultivating type with a digging action must come first.

It should also be noted that the discs of a disc harrow usually require to be set at a greater angle to the direction of draft when working in heavier soils, so as to produce a deeper and more violent stirring action than when operating on lighter soils and that when using the lever-spike-harrow before sowing on heavy soils the tynes are directed vertically or in a slightly forward direction, whereas on light soils the harrow is more often worked with the points set in a backward direction, so as to exert a pressing effect.

The influence of Season on Agricultural practice.

The Agricultural seasons at any rate in the Central Provinces, may be divided into

(a) the pre-rains period, covering the late cold weather and hot weather—December to the end of May.

(b) The Rains—June to mid September.

(c) The post—rains period-mid September to the end of November.

The first and last of these do not vary much in character over the provinces: the second varies considerably, as the amount of rain and the number of breaks in this period during which cultivation becomes possible differ widely, differences which are further intensified locally by the character of the soil and the position of the field.

The first period is devoted primarily to

(1) the eradication of perennial weeds.

(2) the aeration and sweetening of the soil.

(3) the opening of the soil to permit the percolation of the rain.

It is essentially the great preparation time, and though the stiffness of many soils or the weakness of bullocks may in 'rabi' areas cause the essential of depth in cultivation to be sought in the next rains period, it is the season when depth of work on the whole reaches its highest importance. It is the season when the heavy

plough, whether it be the country implement or its better and more efficent introduced rival, the heavy inversion plough, finds its greatest use.

If the ploughing has been done in the early spring, the cheapest time, or if timely rains, at any rate from the point of view of the man who would or has ploughed, fall in this season, the cultivator can be operated in areas of deeper tillage and the disc harrow or heavier form of bakhar where shallower primary tillage has taken place.

If such weathering agents do not intervene to help, little can be done on ploughed land till the advent of the next period.

At this season the plough must be heavy, its weight increasing in importance as the period advances or the depth is increased; the abrupt types of mould board are best, while the smooth finish of its surface is of less importance; the bite and pitch or suction of the plough, as measured by the angle which the share makes with the " landside " and " sole " respectively, thus enabling it to penetrate while running on a flat sole, become of vital importance in making ploughing work easier and more effective.

Before the soil reaches the hard condition to be found in many areas in April and May, the modern disc plough is an effective implement, in particular for ploughing of lesser depths, as, in comparison with the mould–board plough, it leaves the soil in a state which rapidly allows of secondary cultivation. This is of more importance, if the next crop is to be a " kharif " one to be sown early in the next period than if the next crop is to be a " rabi " sowing. In this latter case the coarser the plough leaves the surface the better.

In this season it seldom pays to force tilth by means of special secondary cultivation. As much of the work as time permits should be left to the action of Nature before secondary tillage is brought into play. Unless the primary tillage has been of a

very shallow type, practically speaking no secondary implement can be effective until at least some rain has intervened. After the use of a mould board plough in the dry season, cultivators and disc harrows only come into operation, should such rain occur. Rollers are rarely economic, spring toothed harrows, except possibly in lighter soils, and other harrows still rest in the yard, and the bakhar, unless operating as a primary inplement or after an early performed disc ploughing of shallow character, is not effective. In regard to the depth of such pre-rains, primary tillage depths of 6" and over, performed for the sake of aeration or the removal of perennial weeds, are only advisable if the succeeding crop is to be either a " rabi " or a late sown " kharif " crop. Where early sowing on the break of the Rains is essential, primary tillage is best restricted to a depth of 5" unless the removal of weeds is absolutely imperative.

It is better practice however to make the cleaning of such a field coincide with a crop in the rotation which does not demand early sowing. If this rule is maintained the heavy cultivator or grubber may be left out of the farm's implement list, as the necessity of its use will be very largely reduced.

The second or Rains season is the most active season of the year, particularly in June and early July. It is essentially a season where time is money and where the ability to cover large areas effectively is often of prime importance and where alertness or the ability to take the right moment for work is invaluable. Though in the cultivation to be given for " rabi " crops depth may have to secure attention, on the whole the work of the season is of lighter character and secondary implements of more frequent use

This period is devoted to

(1) the finishing of the "Kharif" crop seed-bed;
(2) the suppression of annual weeds;
(3) the opening of the soil to permit the entry of rain water;

(4) the stirring of the surface to permit aeration, to promote nitrification, to overcome the consolidating effects of the rain and to leave the soil surface in such a condition at the end of this period as to facilitate the mulch making process which follows in the next season.

At this season the heavier forms of plough give way to the lighter types the " Monsoon " and the " Jat ploughs replace the Eagle", the " Subul " and the heavier "Turnwrest".

In the working of at any rate the heavier soils the longer convex mould board tends, in ploughing done early in this season, to give a better form of furrow than is secured by the use of the abrupter types. The finer finished steel mould board, because it scours itself better, has an advantage over the rough harden cast iron boards. "Pitch" and "bite" play a smaller part in the securing of efficient work. Ploughing must be done with care and with due consideration to the fitness of the soil for work, a consideration which grows in importance as the season in which such work can be done, advances.

Turning to the "kharif" crop field, the advent of this season and with advent the coming of the early rains, brings into play the various secondary implements referred to under the first season. If the ploughing has been deep the cultivator followed by the disc harrow or bakhar and possibly the spike harrow is the order of use. If not deep the cultivator can stand out and the seed bed may be prepared by the lighter spring-toothed harrow and the spike or perhaps at the season better by the disc and spike harrows. The roller is not often needed and indeed only, if the early rains are of light character and the seed-bed is thus too loose. An even and firm enough "crumb" below the seed, and a rough top in as far as the depth of seeding will allow is the ideal to be aimed at in at rate loam, clay loam and clay soils.

On the conclusion of this sowing season comes the needed attention to the prepartion of the future "rabi" crop land and to the suppression of weeds on this and on the "kharif" fields.

The first of these may in many cases open with primary tillage the use of the plough. All experiment goes to show that the use of an inversion plough, if not possible or economic in the first season, is more efficient and produces better work than the country substitutes, whether the "hal" or the "bakhar". A depth of at any rate 6" is desirable. Though this effect may be produced by two or three workings of the country plough the opportunity to secure these workings is often wanting. With the "bakhar" it may be said to be almost impossible to reach a 6" depth.

Subsequent to this or like work done in the first season the chief object of cultivation are numbers two and three of the list given earlier. The importance of number two is more in evidence in the last fortnight of August when the opening effect of the initial ploughing has diminished. At this point, if the soil condition permits, a light cross ploughing of say 5" depth is most useful.

The disc-harrow is normally of little use. On the other hand the spring-toothed harrow can be an extremely effective implement in particular if worked in two directions. If weeds do not get hold the "bakhar" is useful. If a long spell of wet weather has intervened, allowing these to get established, the cultivator or the country plough are more effective. If things go well, this season ends with the seed bed sufficiently firm and the top surface in such a condition as to dry out rapidly, so as to allow the work of the third season to proceed.

The objects in view in the work carried on in the growing "kharif" crop at this season are much the same, though in the earlier stages the chief interest lies in the removal of weeds. This arises from the fact that an early attention to weeds in their young or even germinating stage very largely reduces the difficulty of removal and reduces materially the hand labour charges and hence the cost.

One of the advantages of Juar grain in a kharif rotation lies in the possibility the later sowing of this crop gives of destroying weeds cheaply before sowing is started.

The value of the spike harrow is not as much appreciated as it should be. This implement, the lighter " weeder " and the form of spike harrow known as the rotary harrow, are all applicable for the purpose of weed destruction after a crop is sown. If the weather permits, these implements may be used once in a day or two after sowing is complete and again after the crop is up, in cotton after the first two true leaves appear and in a crop like maize or juari when the crop is two or three inches high. Little or no harm comes to the crop itself as the harrows are set to operate to a depth less than that of the sown beed. Operating at this time they disturb and thus destroy the mass of germinating weeds which are coming into life in the top inch or so of the field and thus materially reduce the number to be dealt with later by hand or intercultivating implements.

When once the crop is 5 " to 6 " high and when the field is fairly clean and the weeds are still small, in the earlier stages of the Monsoon, interhoeing is best done by a bladed implement like the local " dhundia " and " daura " according to the size of crop and its interline spacing. When for unpreventable reasons the weeds have been allowed to establish themselves, in the later stages of this season, a toothed hoe, like the " Akola, " is better. It works deeper and thus uproots the weeds, opens the soil for the entry of the last rains, promotes nitrification and leaves the soil in a condition which aids the production of a mulch later.

It is in this season in areas to be devoted to " rabi " crops and to a lesser but yet quite noticeable extent among the " kharif " crops that we find throughout the province the greatest variations in tillage practice. Work in this seasson is governed by the weather, by the amount of rain, by the number of rainy days and by the length of the breaks which permit cultivation. Speed of work during these breaks is a matter of vital importance. An unnecessary day lost in getting on to the work or slow bullocks or slackness of work often spells an increased cost of cultivation later and not infrequently a poorer crop.

The effect of the general character of the season in a particular tract shows itself in the nature of the country implement of commonest use, thus where breaks are likely to be frequent and of fair duration and the rainfall is not heavy, thus tending to the possibility of frequency and militating against lack of aeration and the deep establishment of weeds we find the " bakhar ". Where the reverse is the case the country plough becomes the commoner implement.

Again the quality of cultivation given for instance the wheat crop is in close association with the character of the, weather at this season. The Berar cultivator aided by greater opportunity and spurred on by the all important necesity of conserving a limited rainfall may till his field for this crop seven or eight times. during this period. Near Nagpur the rainfall is heavier the opportunity and the spur are less and good farming as locally practised may represent three to four applications of the bakhar. In Hoshungabad, rainfall is fairly high, wheat soils are very heavy and cultivation at this season declines to two or at the most three, chiefly by means of the " hal. " While if we turn to the Haveli with its low lying-heavy soiled fields in a wet tract, the bund to hold the water on the field replaces open tillage and cultivation at this season is nil.

The third season of the year opens with the closing showers of the Monsoon. It is a season of the year when accurate soil judgement is of great importance. The period of time at this season when the soil is just right for work is of comparitively short duration. Undue haste in cultivation may leave the farmer with a hard stone like set of surface clods which on drying may be difficult to pulverize and may not lend themselves to the production of a good mulch. Undue delay will result in the loss of soil moisture and a surface which is too hard for good work.

Judgement is required to be able to know when the soil has just reached the friable state which lends itself to the work with which this season is most concerned. On this correct moment being taken, the greatest possible speed in working is called for.

Essentially this season is devoted to the protection of the soil from the loss of soil moisture and to a certain lesser extent to surface aeration. Except under unusual conditions cultivation is from above downwards. When the desired depth is secured, it is a matter of fining down this separated layer, so as to increase its protective character to the highest possible degree. The state of fineness aimed at will be governed by the hardiness of the crop to be sown, its rooting character and its economic value. Wheat thus demands as fine a mulch as possible, while gram tolerates much coarser conditions.

It is only on occasion, when the climate and soil conditions of the rainy season have been such as to prevent the work usually done therein, that the operations, dealt under Moisture and Firming earlier in this article, are called for and the farmer is compelled not merely to provide a mulch but to create a seed-bed.

Given that the soil is reasonably clean, as it should be when this season opens, the bakhar and the disc harrow will in a couple of operations provide the necessary depth of " mulch ", which may be a matter of 2 " in linseed, sown early in this period, and 3 " to 3½" in the case of wheat.

After this the harrow alone, with its teeth set vertically, or if the surface is drying to hard clods, the cultipacker or planker and the spike, working rapidly, will quickly create the type of soil blanket conditions may demand.

Vitamins and their role in nutrition

(*N. B. Pandhre, IV year*)

THE prosperity of western nations is largely due to proper adjustment of their diet which forms the main item in human activities If India wants to be free from the rising tide of degeneracy in point of health she should take proper precautions in daily dietary. Every living thing requires food to keep all the metabolic activities in normal conditions.It has been observed that for the normal growth of the animal following proximate constituents are essential.

(1) Carbohydrates which include starches and sugar (2) fats (3) protein of high biological value containing necessary aminoacids (4) Mineral salts and (5) water.

Carbohydrates supply energy and add to the bulk of feed. Proteins build muscles and replenish the loss. Minerals build up the bones and resist the attack of diseases and help in the proper digestion and absorption of assimilated material in the blood.

Over and above these essential ingredients there are still more important substances (factors) the absence of which is easily felt by the body and these are the 'Vitamins'. It has been sufficiently investigated by different workers in the field of Science that these substances are indispensible and without them living beings are liable to be attacked by different diseases because these substances have got direct relationship on physiology of the living protoplasm.

Historical Evidence

As early as 1720 Kramer observed that neither medicine nor surgery could give relief in scurvy but only green vegetables, lime juice, could eradicate this disease Eijkman in 1897 summarised the results of a number of observations which he had made during 1890-96 upon the illness of fowls, similar to beri-beri which he was able to

produce experimentally by feeding the fowls upon polished rice and. to prevent or cure by feeding an extract of the rice polishing. By means of systematic experiments he regulated the theories that beriberi might be due to the presence of pathogenic organisms in the rice, to lack of mechanical stimulation of the intestine or to insufficiency of total food value, proteins or salts.

The explanation first offered by Eijkman was to the effect that the condition is a state of intoxication brought about by the metabolism of exessive quantities of starch and that in the silver skin of rice (and in some other food) there is to be found a substance or substances which counteract the toxic products of the disturbed metabolism and in 1906 he finally stated that there is present in rice polishing a substance of a different nature than protein, fat or salts, which is indispensable to health.

In 1911 Funk first claimed to have isolated the active substance in an approximately pure state. He gave to it the name beriberi vitamine. The Vitamine thus introduced by Funk was obviously designed to indicate that the substance in question was an amine essential to life and bearing special relationship to vitality. He believes this substance to be a combination of nicotinic cid with a pyrimidine base.

Later work of Osborne and Mendel based on observation of the eye-diseases of animals showed the same thing. Dr. Atherton Seiden (New Yark) described his attempts at the separation of the Vitamin B from Yeast by chemical methods.

Terminology

' Moreover the term Vitamine has been criticised both because these substances are amines which is not proved in any case and certainly not probable in all and because the choice of ' Vita ' as a designation is thought by some to carry an exaggerated implications of unique responsibility for life and vitality where as other substances such as tryptophane are no less essential. But if Vita seems to

claim too much in the designation 'accessary' suggested by Hopkins is certainly too modest. In order to avoid these difficulties McCollum suggested that until such time as chemical names can properly be assigned to them these substances be known by alphabetical designations qualified only by such statement of their solubilities as may seem helpful and hence he named fat soluble as A, water soluble B and so on.'

Quite recently Drummond (1920) has suggested that the designation now most common, those of Funk and of Mc Collum be combined and simplified both for convenience and to free them from questionable implications as follows:—

" That the alphabetical designations now familiar be retained but without the antecedent statements of solubility and that the original designation of Funk be retained but the final 'E' be dropped so that the resulting word Vitamin shall carry no implications as to the chemical constitution of the substances. If this suggestion is dropped the three substances now recognised as belonging to the group may be designated as Vitamin A. B. C. respectively."

Definition and their role

" Willaman defines the Vitamins as a class of substances whose presence is necessary for normal matabolism, but which do not contribute to the requirements of the organism as regards inorganic constituents, nitrogen substance, energy producing constituents."

Fat soluble Vitamin is called Vitamin A and also called antirachitic Vitamin.

And water soluble Vitamins are called Vitamins B and C.

Vitamin A is essential to growth, when the intake of Vitamin is inadequate, not only is growth inhibited after a time but there also develops increased susceptibility, to infections of diseases such as ophthalmia, rickets, tuberculosis etc. It has also a marked influence upon the capacity of reproduction and successful suckling of the young. It is an important factor in the general stamina and ability to resist diseases of the body.

Vitamin B —in rice polishing, absence of which causes loss of appetite, cessation of growth and finally pathological symptoms resembling those of beri-beri. The symptoms are:—under-nutrition, derangement of the function of the organs of digestion and assimilation, disordered endoctrine function and mal-nutrition of the nervous system. B is relatively stable to oxidation and heat, is evidently more stable in acid than in alkaline solution. This is called anti-beri-beri Vitamin.

Vitamin C is very readily destroyed by heat and is very susceptible to oxidation. It is more stable in an acid than in neutral medium and still less stable when the medium is alkaline. Drying again and again often results in considerable loss of this Vitamin but these losses, are probably determined by factors time, temperature, acid c ncentration and exposure to oxidation. This is called antiscorabutic C.

The distinguishing feature of the B Vitamin when compared with Vitamins A and C is the effect of its greater stability which tends to make the problem of its ultimate isolation and identification a more and more hopeful one than that of the Vitamin C with its marked susceptibility to heat, to alkalinity and to oxidation and of Vitamin A with its suceptibility to destruction by oxidation and the technical difficulties involved in its colloidal character.

Over and above the Vitamins A.B.C. there is also Vitamin D.

Professor Mellauby's theory that the deficiency in nutritive value of cereals and more especially oat-meal is not due to lack of Vitamins but to the presence of an actual poison to which he has given the name of toxamin.

" It was chiefly oat meal that was the subject of Professor Mellauby's attack since the result of his experimental feeding of puppies with this grain as compared with other cereals was so bad that he came to the conclusion that the oatmeal at least contained an actual poison and was not merely lacking in Vitamin D the

wellknown food factor whose absence from the dietary of the children and young animals is responsible for the production of rickets.

Now, however Professor Steinbock of the University of Wisconsin who is an outstanding authority on the properties of this very Vitamin D, has according to a note in Science, very carefully repeated Professor Mellauby's experiments but has failed to obtain any confirmation of his theory. He states that, while he finds oats to be somewhat inferior to wheat in the matter of preventing rickets, he can find no evidence, they are as bad as Prof. Mellauby paints them and that he is not convinced of the hypothetical toxamin. Moreover he is of opinion that even cereals may artificially supply the Vitamin D, by exposing them to Ultra-violet rays.

As we directly or indirectly live upon vegetable kingdom it will not be out of place here to narrate the role of Vitamins.

Seeds and green parts of plants have greatest amount of B and varying amounts of the Vitamins A and C, are generated upon the germination of seeds.

In higher plants there are three possibilities (1) In seeds stored up Vitamins suffice to stimulate further synthesis of Vitamins in the growing parts of the plants.

(2) It is possible that the small amount of Vitamins in seeds suffices to carry the plants to a certain stage of growth after which there is symbiosis with certain micro-organisms which provide the plants with Vitamin.

(3) It is possible that some of the plant structure for example the leaves possess the ability to synthesise certain Vitamins.

Discovery by Hopkin 1912

The green tissues of plants would seem to be the chief site of Vitamin synthesis, although lower forms of plant life devoid of photocatalytic Pigments can apparently produce the Vitamin B. So far I have described different Vitamins but it remains how the Vitamin theory should be applied to the daily diet. Ordinarily

daily diet consists of (1) cereals (2) proteins (3) vegetables (4) milk, and with those who are non-vegetarians, flesh.

A chart showing different Vitamins present in different food stuffs, will make the meaning clear.

	A	B	C
Cereals			
Rice. (polished)	—	—	—
Rice. (whole grain)	+	++	—
Wheat embryo	++	++	—
Sugars and starches			
Glucose	—	—	—
Honey	—	+	—
Starch	—	—	—
Sugar	—	—	—
Fats and oils			
Butter	+++	—	—
Linseed oil	—	—	—
Meats and fish			
Meat (Muscels)	—	+ ?	+ ?
Fish	+	++	+ ?
Fruits			
Bananas	+ ?	+ ?	+ ?
Grape fruits	?	++	++
,, Juice	?	+	+
Lemon Juice	—	++	+++
Mango	?	?	+
Limes	—	+	+
Tomato (raw)	++	+++	+++
,, (dried)	++	+++	++
Tamarind	?	?	+
Vegetables			
Beans	++	++	++
Cabbages (fresh raw)	+	+++	+++
,, (cooked)	+	++	++
	A	B	C
Cauliflower	+	++	+
Cucumber	?	+	?
Onions	?	++	—
Peas	++	++	+ ?
Potatoes (sweet)	++	+	?
,, (white) raw	+	++	++
,, (boiled) 15 minutes	?	++	++
,, more	?	++	+

Milk and dairy products

Milk	+++	+++	Variable
,, condensed	+++	++	+Variable
,, evaporated	+++	++	———
,, skimmed	+	++	+
Butter	+++	—	———
Butter Milk	+	++	+variable.
Cream	+++	++	+
Cheese	++	?	?
Eggs	++	+	?
,, (white)	?	?	?

+++ Indicates that the substance is an excellent source of Vitamin

++ Indicates that the substance is a good source of Vitamin.

\+ Contains Vitamin.

——— ,, no appreciable quantity of Vitamin.

? Indicates the doubt as to the presence of Viatmin.

The chief type of food according to the nutritional significance of each may be grouped some what as follows.

(1) Grain products:—Economical sources of energy but not satisfactory in their mineral and Vitamin content.

(2) Sugars and fats:– Chiefly significant from the nutritional point as supplementary sources of energy although some animal fats are important sources of Vitamin A.

(3) Meats:—Including fish and poultry rich in protein or fat or both but in general showing the same mineral and Vitamin deficiencies as do the grain.

(4) Fruits and vegetables:—Varying greatly in their protein and energy values but very important as sources of mineral elements and Vitamins.

(5) Milk:—Important as a source of energy, protein, mineral elements, and Vitamins and possessing unique efficiency as a growth promoting food. As milk and vegetables form the most important items of diet I will describe in brief their role in them.

Milk:—Milk contains all the Vitamins in sufficient amount and hence it is a complete food by itself. The Vitamin content of the milk depends upon the Vitamin content of the fodder. It was found out that it contains more of Vitamin C and more of

Calcium, Phosphoric acid and Citric acid. Influence of heat on milk not only destroys the Vitamins but injury is also done to Casein. By slow heating calcium glycero-phosphate is deposited. There is probably a much larger seasonal variation in the amount of C Vitamin contained in cow's milk than in either its A or B Vitamin content. This being now recognised it is only necessary to use a small amount of orange juice or other antiscorbutic fruit or vegetable product with a liberal supply of milk in any of its various forms to ensure an ample intake of all the three Vitamins at all seasons.

In Austria, after the great war, babies that were being fed on a liberal amount of condensed milk made no growth what-so-ever until lemon juice and water were given to them every day.

Precautions in feeding milk to children

(1) Hygiene of the cow, (2) good fodder, (3) least possible boiling of the milk, (4) least possible storage after milking and after pasteurization.

With regard to stock farming the chief practical suggestion of the Vitamin school is that codliver oil which is rich in fat soluble A should be more expensively used for farm stock. It increases the assimilation of Ca. and P. For heavy milking cows, codliver oil is best as it promotes the digestion of Ca. The object of taking codliver oil by human beings is the same as it contains Vitamins.

As a result of certain experiments, it is investigated that ultra-violet rays increase the content of Vitamin D which is essential for the dietary of children and young animals.

Vegetables and fruits:—Leafy vegetables such as Lettuce and Spinach are relatively un-important as sources of energy but are very effective supplements to the grains, being rich in the mineral and Vitamins in which the grains are more or less deficient. Their importance is due to richness in Vitamins and because of their beneficial influence upon intestinal hygiene and upon the elimination of wastes from the body.

In the average American food supply, vegetables represent one tenth of the expenditure for food and furnish about one tenth of the total Calories. Of the total proteins, of calcium, of phosphoric acid, and of iron they furnish a much larger fraction. It is probable that vegetables also furnish more than one-tenth of the Vitamins in the average dietary.

It has been seen that many of the green vegetables rank high as anti-scorbutics and this property as well as their richness in Vitamin A and in Calcium is doubtless a factor in the important part which these vegetables play in the dietary of oriental region where milk supplies are even less adequate than in America and Europe. Professor Laird of the Canton Christian College writes that a typical working woman in that part of China eats $2\frac{2}{3}$ lbs of rice, $1\frac{2}{3}$ lbs of vegetable and a few cents worth salt, fish or pork.

Mr. Y. G. Chen a native of the Nanking province considers that green vegetables are probably at least five times as prominent in the diet of that region as in the American diet. Certainly it would seem quite impossible for China and Japan to support such a dense population subsisting so largely upon rice and escape the deficiency in diseases in so far as they do, except for the large use that they make of the green vegetables and edible roots. Another factor of safety in the dietary habits of the Chineese is in their use of sprcuted seeds. Also Indian and especially Maharastrian diet contains sprouted seeds which are named as '*Usal.*'

Potato has got considerable anti-scorbutic property which in the grain can only be developed by careful sprouting but now the tendency of the educated classes is to take potatoes boiled and outer skin removed. This is objectionable because outer skin contains the Vitamins; the remaining portion is nothing but starch. It is due to this that Irland has got many cases of beri-beri. British cruciferous plants are eaten as anti-scorbutic owing to their Vitamin content. Peas and beans have got even distribution of the Aminoacids but only consuming these will impair the health in absence of wheat because it contains Glutamic acid, one of the Amino acids whose percentage is 14 to 16 in human muscles.

It will not be out of place here to suggest the diet in case of men suffering from tuberculosis and Anaemia (poverty of blood).

Woodlock and Rustin stated that the diet in tuberculosis must be rich in protein and fat in the form of milk or milk products. If margarine is used it must be Oleomargarine which contains Vitamin A. The diet must also contain plenty of fruits and vegetables.

Anaemia:–Madsen is of the opinion that the Vitamins play a great part in Chlorosis and Anemia. Geiling and Green subjected this question to experimental test. If the rats were given a diet poor in proteins, Vitamins or salts, then the blood regeneration after a Haemorrhage was markedly retarded.

In conclusion, I must say that diet forms an important item in the living beings and as such proper precautions should not only be taken in balancing the ration as regards protein, fats, carbohydrates but also in Vitamins. On the nutritive diet depends the prosperity of nation. From all these facts we can conclude that there should be a liberal supply of fruits, vegetables and milk if we want to be healthy.

A College Professor solves a Mathematical Problem and Becomes a wealthy Inventor.

(What Mr. Hazeltine has been doing in the radio field, can be done in other spheres as well. His remarks regarding spade work deserve special attention—Editor)

WHENEVER we think of inventors, we regard them as different class of men who eagarly seek some idea upon which they exercise their genius. We imagine them bending over a work bench surrounded with wheels and wires and miscellaneous articles trying first this combination and then that until they work out their inventions which ultimately secure them a fortune

Here is an inventor who is not like them at all. Louis Alan Hazeltine, the man, responsible for the Neutrodyne radio receiver, never thought of himself as an inventor, never looked for anything to invent, never had any intention of making a lot of money. He believes he is weak in imagination, that quality so often considered necessary to suceessful invention, has put far more time in writing a book than he has done in inventing, has done his inventing only as a sort of sideline. All the inventing he does, is with a pen and a note book.

From Stevens, Hazeltine graduated in 1906. Usually elementary schools, high school and college take 16 years of a youngman's life. He did them in 12. Leaving Stevens, he entered the testing laboratory of the General Electric Company in Scheneetady. A year later he took a position as assistant in the Department of Electric Engineering at Stevens Institute. On that college staff he remained until two years ago.

In 1915, E. H. Armstrong read a paper before the Institute of Radio Engineers on the fundamentals of the three electrode vacuum tube and in particular disclosed the tubes capabilities for regenerating and oscillating. It opened for Hazeltine a field for complex mathematical analysis in which he could revel to his heart's content. He began a theoretical study of the vacuum tubes operation and worked out the theoretical requisite for producting oscillations. Then for the first time, he obtained a vacuum tube and traced its characteristic curve. With all the necessary information assembled he designed and wired his circuit. In practice it worked out exactly as it had on paper, and oscillations were produced on the first trial.

For two years more he continued his theoretical studies, using actual experiments from time to time only to verify his calculations. In 1917 he wrote a paper on Oscillating Andion Circuits. It is on this paper that Hazeltine's work in radio is based. The secret of successful inventing is according to him a thorough knowledge of fundamental principles of any branch of knowledge.

He says, ' I never had any intention of being an inventor. Mathematics was always my favourite subject in school. It was in Mathematics that I used to get my highest marks. When I entered Stevens Institute of Technology I thought I would like to get into teaching. What I wanted to take up, I had no idea but I was prejudiced against electrical engineering. Near the end of my course I began to feel that the performance of electric apparatus could be predetermined more accurately than that of mechanical apparatus. Here was plenty of opportunity to work out Mathematical problems. So I took up electrical engineering in spite of my former prejudices '

' For any thing I have been able to accomplish a thorough foundation was necessary. I spent years in theoretical investigations. The time I spent on physical engineering problems was enormous and it is surprising how many of the principles and methods proved extremely useful later'.

' I have never been looking for new ideas and most of my work has not been done with any thought of money. I expected to spend my life as a college professor on a notoriously small salary for I knew it was work in which I would be happy. The text book on engineering published some time ago took more of my time than all my inventions and there is far better work in it than in the Neutrodyne.'

'That I have become an inventor probably is a logical development. I should say that if any man is a competent engineer working in new development work, he cannot help making inventions.'

Cottage Industries.

(R. A. Ramayya, L. Ag.)

"COTTAGE Industries" is a comprehensive term which includes all those industries which can be practised by the people within their own hamlets Some people take to these Cottage industries as their primary occupation while others take them as a hobby and at the same time as a subsidiary source of income.

The kind of Cottage industries that can be adopted by the people depends upon conditions-social and economic. Situated as we are, with the caste system, with its many sub-sections, some of the industries have become hereditary being handed down from father to son. Thus, some of the industries like tannery, basket making and others are not taken up by people other than those who are already practising it Though, such a socio-economic structure of an Indian Village may look quite strange and may sound non-sense to the western mind, still it is a fact that should be admitted on all hands that the practice carried out is based on firm economic system of " Division of labour. " Instead of swelling the number by adding more to the same industry, best results are derived by suggesting improvements to the people who are already carrying the trade and thus make them skilled workmen. There are existing already some cottage industries but they are in a dilapidated condition, being neglected by the hereditary castemen due mainly for want of support and encouragement. Evidently, what is necessary is protection from foreign aggression. India was humming with cottage industries, as more than one English historian has remarked,; before the importation of machinery. India being an agricultural country, the people in the villages, at least a majority of them subsist on what little they get out of their land. But agriculture does not and cannot provide work for the labourers

throughout the year. Hence is the necessity of some supplementary industry which can be taken up only for a part of the year when they have no work on the farm.

"The poor villager left to himself, depends entirely on his plough. The very insignificant income he derives from his plough is too small for his expenses His expenditure greatly exceeds his earnings as he has to purchase a variety of other materials like cloth, salt, kerosine oil, dishes, lamps, cooking utensils, sugar, matches, needles and what not. Naturally he gets into debt. Recurring deficiency of his earnings as compared with his expenditure increases his debt and leads him to bankruptcy. This is the inevitable result of the destruction of cottage industries."

Revival of cottage industries is the only panaccea for all evils. Spinning is the one industry which can be universalised. It is the only industry which can be taken up supplementary to agriculture, and which can be worked by all who are not able to go out for work, and others in their leisure. The powers that lie behind the spinning wheel is latent. Because, with the revival of that one industry in the village, number of other industries will have their revival and new ones also will take birth. Spinning wheel will give fresh impetus for the manufacture of indigenous dyes from village raw-materials.. It will give more work for the weaver and printing designs of cloth will be developed. With the demand for designs, the carpenter will get more work and artistic work on cloth will have due attention. Thus, the little cottage industry neglected all the time, will be a nucleus around which a host of other industries will prosper and breathe new life and vigour.

Foot Ball Notes.

FOOTBALL session for this year began in the middle of July and ideal weather conditions are prevalent this session.

Every year we have to lose some of our good players, who go out of the College after completing their course. This year is no exeception to it. Das Gupta. Esq. B. Sc, L. Ag, the veteran player of our College in the left half position has completed his course. We wish him a bright future. We are sorry he would not be available for our team in the University tournaments.

This year the College Football eleven is captained by N. A. Khan. He is a dashing Centre forward with sound kicks. His passing is graceful and heads quite sure. His corner kicks often cause anxiety to the opposite party.

Das Gupta's position is replaced by M. A. Rab, who is a steady player with forcible kicks. His short stature puts him in a very disadvsntsgeous position, for it often happens that by the time he tries to head the ball his opponent who may happen to be a taller man does not allow him to display his skill at heading the ball, a sight which causes laughter in the spectators gallery.

N. A. Ahamad plays right in. His game is quite brisk and his passiug lightening like, but his kicks are many a times wild.

Bakre, the right out has a good passing but wants little pluck to charge the opponent.

D. N. Das is a formidable left out. He plays a dashing, brisk and exciting game. His kicks always cause anxiety to the opposite party and great excitement to the spectators.

Kalamkar plays this year in the Centre half, though his usual position before was the right half. His rushes are models of

what Centre half's rushes should, although on many occassions they are spoilt by over enthusiasm. We are sorry that his left wrist was fractured while playing the match against the Fort team. He was at his best in that match. We hope he would soon recover and join us. With little practice of kicks he promises to turn out a very good player.

We heartily congratulate H. K. Das who is a very good addition to our team. He is a giant figure playing right half. His kicks are forcible and judgement sound but he is rather lazy in his movements.

Reddy plays left half. He has a terror inspiring personality and the opponent has to think twice before he opposes him.

Khan is a very good addition to our team indeed. He is an allround player. He is a formidable back with sound judgment.

Lakhkar is a second back. His dashing is admirable and kicks forcible.

Chatterji has established his reputation as our best goalkeeper.

S. C. Roy, the games secretary, takes active interest in the game and guides and instructs the students. S. C. Roy, B. S. Rao, Das Gupta and Krishana Murti, the best players of our College can not play in the University sports though of course they would be of great use to us in the Public tournaments.

Deshmukh, Akram and Kolte are promising players. A little practice on their part would make them better at the game.

We have up till now played four matches and we are glad to record that we came out successful in three of them.

Our Cricket.

AS usual Cricket season began in the first week of July. As compared with the teams of other Colleges, our team was awfully poor in every respect. The three main constituents of the game viz. Bating, Bowling and Fielding, were almost fragile and we had to exert a great deal in every match.

Deshpande and Dange–last year's players of our College, were conspicuous by their absence. To some extent our situation was saved by the addition from the new first year students. The staff members Messrs. Subbarao and Kartarsingh helped us a great deal. Mr. Kartarsingh played with us all the matches but Mr. Subbarao was unable to attend some of the important matches owing to illhealth.

Khan—All round man with a sound bat. His bowling has saved us from infinite running, many a time.

Tyagi--Cares much more for the style–even at the cost of the wickets. In fielding it is better that he keeps aside his grace. His score was nice throughout.

Bakre—Excellent bat and fielder. Very fond of playing maches continuously.

Joshi, V. M.—A good bowler. Due to his appendicitis this year he gets tired very soon and could not reach the mark.

Kelkar—Most sincere man with very high ambition for picking graceful styles in Bowling, Bating and Fielding. His 'Stopping' is wonderful and some of his 'Pithes' are unparalleled.

Lakhakar—None can challenge him in his fielding though lacking in grace. His throw runs from boundary to boundary.

Karnik—Nervous man, otherwise a steady bat; can try him as a bowler when the rest are tired.

Rest--They have to pick up practically everything and are novices in the game. But considering their great achievements within such a short time, the College will in no way be mistaken to expect excellent future from them.

Umpires and Scorers:--Many thanks to Messrs Phadke (K. N.), Datta (A. B.) and Pandit (L. R.)

Gleanings from Periodicals.

Eradication of kans.

Kans is a perennial deep rooting grass weed which lately in many parts of India has been responsible for a reduction of the cotton crops by at least a third. Tractor ploughing and manual digging have both been tried but though fairly satisfactory, these methods have proved too expensive. Heavy soil inverting ploughs were found to be very slow and also productive of bad results on the black soils after the rains, consequently large clods preventing the work cattle walking on the cultivated surface.

Success has however been attained by an adoptation of Pand O 10" ridging plough of the Inter-national Harvester Company by removal of wings and sole and working to a depth of 8" or 9". the depth of working being adjusted by the front wheel. The yoke is attached to the plough by a strong chain so arranged that the line of the draught passes through the centre of resistance of the share. The draught is by 4 oxen walking abrest provided with one long ladder--like yoke, 9'—4" long by 1'–7" deep, fitted with iron pins to prevent the oxen getting off the yoke when turning. The animals are thus found to work to-gether and to exert their maximum power. Work done is about an acre per day at a cost of just under 5 Rs. The most effective time for the operation would appear to be that of active growth in the rains or at the beginning of the cold weather.

Agri. Journal of India

Preservation of fruits

Experimental Research on oranges:—Idea underlying the preservation is that oranges kept in control boxes with some chemicals are safely guaranteed by the evolution of gases from chemicals and thus preserve the texture of the fruits. They are presered under ordinary temperature. The chemicals used are viz Carbonate of ammonia, trioxy methylene, hexamethylene, tetramine with citric acid, peroxide of henzoyle.

The best results for the preservation of boxed fruit were produced by carbonate of ammonia and trioxy methylene with which the loss of weight in a month and half was only 1.40%. Moreover, out of 120 specimens only 5 deteriorated as against all in the control boxes.

Carbonate of ammonia used alone gives practically as good results. Loss of weight 1.71%; 5 oranges damaged out of 150.

As regards packing fruit, preserved in boxes hermetically closed loses colour and all organoleptic qualities.

In a practical trial of packing and transport, the use of carbonate of ammonia and trioxymethylene was entirely satisfactory.

Period of preservation was from 2 to 21 June 1927.

—International review on Agriculture.

Chemical Composition of Sicilian oranges.

Juice	Picked 26 Feb.	Picked 15 March	Picked 15 April
Specific wt. at 15°	1.0510	1.0525	1.0540
Alcohol p. c. in Volume	0.07	0.07	.07
Dry extract per thousand	132.30	136.20	140.10
Total acidity ces (KOH N/10 p.c.)	205.50	185.0	175.4
Reducing Sugar p.c.	36.60	64.40	69.73
Non reducing sugar in saccharose p.c.	9.50	32.87	34.20
Total nitrogen p.c	.75	1.05	0.98
Protein nitrogen p. c.	.10	0.16	0.15
Non protein N p.c.	.65	.89	.83
Ammonialcal nitrogen p. c.	.03	.04	.02

From the above chart conclusions as to the picking time should be drawn.

Pest destruction by Aeroplane.

Aeroplanes have been employed for the destruction of insect pests in the united states since 1921, and have been used against forest pests in Germaney and France, and,to a slight extent, against orchards and petato pests in

England. The aeroplane used for dusting cotton in the United States had special hoppers, which deposited a thin stream of finely pulverised calcium arsenate into the current of air generated by the propeller and the drift of the plane, the velocity of which current had been raised to some 200 miles an hour by a funicular scoop. The down draught of air then forced the powder down into plants. When dusts are applied in this way a damp surface of the leaves is not essential, owing partly to the force with which it is blown upon the crops and partly to the minuteness of the dust particles, but chiefly to the fact that the latter, in the process of delivery, became positively charged with electricity and come into contact with plants negatively charged. In view of this a ground machine utilising an electrical apparatus has been invented, which may be worked in day time without having to wait for the night dews.

The two main types of aeroplanes used for cotton dusting in the United States are a small machine for small areas, carrying 300 lbs insecticide and a larger one for large estates carrying 1000 lbs. Both types can remain in the air for 4 hours. They fly at 5-25 ft above the crops, at a speed of 80-90 miles an hour and dust 75 acres a minute in slightly overlapping strips some 200 ft wide. Besides cotton, spruce, pecan, tobacco, peaches, potatoes, citrus and sugar cane have been successfully dusted by aeroplane in America.

—*Review of the applied Entomology.*

'Two basic facts in favour of Silage'

The beauty of silo conservation is that you can store an enormously greater quantity of fodder in the same space than is possible with a hay stack and you are able to conserve the crop, while it is heavy, succulent and digestible. Further you are able to take a crop just at right stage and to put it away. Possibly there are men who will say, 'we have a district in which there is no frost and we can go on cutting each day.' I will not listen to them for a moment. When you conserve by means of a silo, you conserve food at a stage when it possesses the highest possible food value. There are men who say that they are able to go out each morning and freshly cut sufficient for the day's need but to do so they have to harness a team, collect tools, have a man ready and cut the fodder each time with a chaff cutter. They have to go to that trouble each day and each day that their crop is standing it is going off. Whereas to fill your silo means that you concentrate for a week or two and the whole operation is done within that time. The two basic facts in Silo conservation are that you conserve your crop at the right stage and you concentrate the work within a matter of a week or two. You have your food supply convenient to your hand and in a clean and suitable form.

Agricultural Journal of N. S. W.

"Faults in Indian Cotton."

The Royal Commission on Agriculture heard evidence lately from the Oldham Master Cotton Spinners' Association. Mr. James Littlewood of the Royton Supply Co. who appeared on behalf of the Association put forward some suggestions for the improvement of the Indian Cotton used by Lancashire spinners. He mentioned that almost 100,000 bales of this Cotton are used in Lancashire each year.

Among the points made by Mr. Littlewood were the following:—

If the trade is to be expanded, attention in India should be concentrated on the cultivation of such varieties of cotton as can be substituted in English mills for American Cotton. The style of cotton required is white or creamy in colour, good grade (i. e. pure from leaf, seed, and stains) staple $1\frac{5}{16}$in. to $1\frac{1}{8}$ in. with diameter of fibre similar to American and packed to a density not higher than a standard 400 lbs. bale. Few mills use Indian cotton alone but with American. Some of the troubles experienced by English Spinners who use Indian grown cotton are as follows.

1. Mixed-seed:—This results in irregularity in the characteristics of the bulk Cotton; hard and strong, soft and weak fibres mixed together and variegated colour.

2, Deterioration of seed:-well-known standard types of seed which formerly produced, say good 1 in. staple have gradually deteriorated in the last few years till only a bare $\frac{3}{4}$ in. is now the result. Too much attention cannot be paid to the desirability of keeping, the longer staple from the shorter. Cotton which shows a fairly even 1 in. staple is of greater value to the spinner than cotton which varies from $\frac{3}{4}$ in. to $1\frac{1}{8}$ in. The mixing in of short stapled cotton causes excessive waste to the spinner and he at once condemns the cotton.

3. Crushed seed;-This is a serious cause of trouble, because of the stains produced by the natural seed oil.

4. Ginning;-Increased care is necessary in this process. Inefficiency is responsible for quantities of crushed seed, excessive broken leaf and seed besides quantities of whole seed left in the cotton. The roller gin is predominantly in use in India, but we find that there are some types of cotton which are much improved by being saw- ginned.

5. Density;-The standard cotton bale is one of 400 lbs condensed to about 10 cubic feet. This is much higher than the density of the American bale, which as a rule does not exceed 30 lbs. per cubic feet. The English spinner who normally uses American cotton finds difficulty in opening the harder pressed Indian bales without specially adapted machinery. If he receives the

500 lbs bale the difficulty is much increased for the normal user of Indian cotton, and is almost a certain detriment to a new user. if there is an excessive amount of damping of cotton before compressing, as this produces caking.

Spinners in England using various kinds of cotton require a continuous supply of each kind during the whole year, so as to maintain regularity in their yarn. A great drawback has been that spinners have not been able to rely upon getting consistent shipments as regards quality even during the same season. The establishment of reliable standard types, with confidence that shipment could be depended upon, would be an important factor in attracting more spinners of American cotton who are accustomed to seeing the cotton offerd for sale before purchase or in being able to rely with safety upon placing a deferred dilivery contract in American cotton.

5. Complaints;–It is suggested that it would be an advantage if a sort of clearing house for complaints were established is this country, to which complaints of a general nature could be addressed by spinners and dissiminated to the appropriate quarters for noting and correction.

—*The Testile recorder.*

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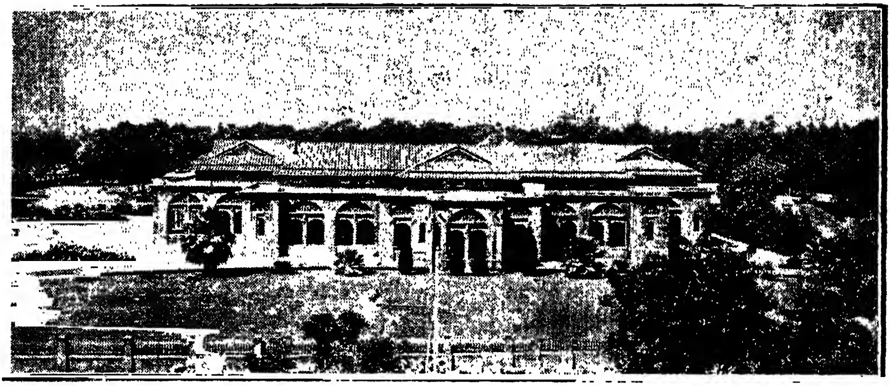


Our Research Institute.

Not only in improved farming should the influence of this College be felt; it should also be felt in a growing appreciation by the land lord of his responsibility of his duties to his tenantry and his property.

—Hon. A. E. Nelson.

VOL. II No. 3. JANUARY, 1928.

Editorial Notes.

Unity

'NEVER has India needed unity of spirit more than at the present moment' so said the worthy Chancellor of the Nagpur University at the last Convocation That was the advice he asked those luminaries who assembled there to carry with them. Are we not sorely in need of that spirit? Have we not even in the portals of this temple of learning enough of differences, the Hindus and Mohamadans secretly despising each other, the Brahmins hating the non-Brahmins and vice versa, the Deccanis and the Northerners constantly quarrelling over trifles? Gradually but steadily the evil is eating into our vitals. At first there was a Ganesh festival in which everyone 'irrespective of caste and creed' took

part. Now we learn of the birth of 'a Krishna Ashtami'. We may at no distant day be celebrating the birth day of Mohamad and of Christ and cf Budhha and the Sikh students might easily say why not of Guru Govind. The drama episode so important a function in the social gathering has proved to be such a knotty problem that the authorities, here and elsewhere have deemed it proper to drop the item entirely from the usual programme. If these and the like serve to widen the gulf between man and man instead of bridging it, let us have done away with them.

The contagion has scaled even higher heights. The gradation in the College staff is greatly helping to accentuate differences. Let the New year dispel the vicious atmosphere, let it maintain a sovereignty and nobility not of money and of pay but that of mind and and of genius, let it help us to do away with the petty trifles and false sense of diguity in view of the common supreme goal, let us pull down the barriers that separate us and breath once more the purer and nobler air that is our birth right.

Eloquence

The elocution competetion this year revealed immense possibilities. We have among us a large number of stndents who promise to be good speakers. They may well be the future leaders of the province belonging as they do to a College noted for practical work and to a profession bound to exercise great influence over the peasants. The budding speakers may find an encourgement in the fact that the way to power, influence and wealth, specially in this age, lies through effective power of speech and practicality than through anything else. Many an intelligent man today has to occupy back benches simply because he is dumb and many an ordinary man has come to the fore front merely due to the power of his speech. Follow the illustrious examples of Pericles, Demosthenes, Bright, Gokhale and Raman and Coolidge, cultivate the art and reap the sure harvest.

Our Requirements

We badly require a water room in the College premises as also we do a urinal and a lavatory. It is simply ridiculous watching

students easing themselves by the garden fence or the well compound. It is both insanitary and indecent.

The laboratory taps are used by the students with the result that the entire demonstation table gets wet and the lecture Halls present a most filthy appearance. Matters reach their climax when some of the College servants enter a hall to satisfy their thirst for—water.

Something must be done to prevent the interruption of College work by the Postmen distributing letters, parcels and moneyorders when the class is busy.

The College Hall must be furnished with chairs and a decent table is absolutely necessary on the dais. The present inconvenient round table may well find place in the reading room or a students Common room.

Out of the Mouths of Eminent Men.

Your Success should be a stimulus to greater success and your failure to greater and more strenuous efforts to retrieve it. Then you will find that the setback has been a passing phase.

* * *

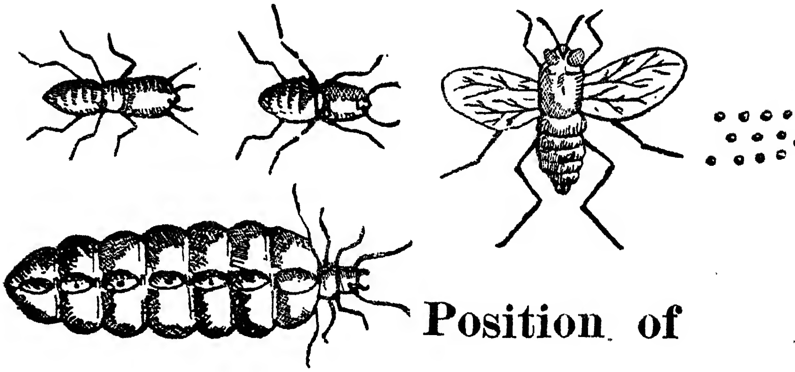
Competetion from abroad will compel efficiency or drive inefficient industries out of existence.

* * *

If an individual policy is adopted of purchasing goods locally made wherever a choice is possible, the result will be increased confidence on the part of manufacturers, establishment of new industries and a demand for skilled labour. In building up our national strength we make our greatest and most valuable contribution to imperial strength and unity.

* * *

The season and the prices are not alone to blame for the shortness of money and the failure to make the farm pay. A short period of intense thrift would be healthy for us all and do the country great serviee.



Position of Entomology in Indian Agriculture

(J. L. Khare, B. Sc., F. E. S.)

Entomology is a Science about insects that we see so many round about us. The study of insects reveals a world in itself. There is so much close relationship between insects and human beings that we cannot do without them. To human beings, either directly or indirectly they may both be injurious and useful. The existence of insects attacking crops and the trouble some of them often give, have been known to the farmers from time immemorial all over the world. And the insects directly affecting human beings have attracted the attention of the medical men very recently, probably dating from the discoveries by Mason of the role played by certain mosquitoes in the transmission of germs of filaria and the mode of transmission of malaria by Roso. The latter discovery has proved of infinite value to the human race. These two discoveries have caused the insects to be looked upon as definite carriers of disease which otherwise were only considered to be pests of crops only. Thus the relation between insects and the human beings has become still closer. Neither the human beings nor the domesticated animals have escaped from the ravages of insects as several forms of diseases have now definitely been proved to be carried by specially those insects which have a great liking for the meal of blood such as fleas, flies, bees and mosquitoes.

Having dealt briefly with the insects which are looked upon as the deadliest forms of enemies of human race, I shall take up now the insects which affect agriculture and thus indirectly affect the economic conditions of the farmers. But while one is taking into account the stupendous loss caused to the agricultural crops by various pests one cannot ignore the existence of a great many insects and their great ulitily viz. bees, silk insects, lac producing insects and many others. Bees produce some score of millions of pounds of honey and give another equally valuable product, the wax which is collected in very large quantities. Lac is another commercial product giving revenue of lacs of rupees to the Forest department. Similarly the value of exported silk, which again is an insect product amounted to several lacs some years ago, but the export value has gone down because of the Indian silk having deteriorated in quality. Attempts are being made by crossing different racesof silk insects to improve the quality and thus regaing the lost reputation which the Indian silk once enjoyed in the world.

Turning now to the injurious insects to Agriculture, it has been computed by those who are best in the position to judge that the annual damage to the agricultural crops alone by insect pests is about 10 percent that is to say a farmer who reaps what he considers to be normal crop actually gets only nine-tenths of what he would have got had there been no damage by insect pest. If by a study of insects and by practical application of the knowledge gained thereby one can save even a fraction of this enormous loss it would mean a saving of lacs of rupees. Now the next question that arises is how to reduce such a large wastage. It is well known that in different parts of the country various ideas are current as to the origin and nature of pests and several local practices are in vogue to check the insect depredations but unfortunately there is very little scientific tinge in them. Many of them are emperical and are to a great extent due to local beliefs entertained by villagers as to the causes that bring about the insect out breaks; such as God's curse, the alleged bad position of the plant for the season, prediction of a local astrologer, the displeasure of a particular diety, a

neighbour's black art or evil eyes, approach of a polluted man or woman and so on. It need hardly be stated that none of such causes would generally appeal to a scientific worker and could therefore be brought within the realm of practical politics. But although the farmers are totally ignorant of the elements of insect life and the possible causes that give rise to occasional pest, yet in many cases methods of cultivation have been evolved by them owing to accumulated experience of ages, best suited to the successful growth of the crops which otherwise are liable to be seriously affected by insect pest. As stated before the farmers have no knowledge of life, to them a Caterpillar is an insect which is born and dies as such, a butterfly resulting from it is a separate insect, this ignorance of insect life is not simply confined to the illiterate people but is equally prevalent among the educated as well.

Measures of control and prevention against insects may be broadly placed under two catagories. In one case definite results can be obtained by the adoption of certain definite measures like spraying poisonous medicinal mixtures or using fumigants so that the insects are killed and the plants are saved. Great progress has been made in this direction in America and Europe and a good deal of work is being done in this direction in India and similar results obtained. In the other catagory such definite results can hardly be expected and under it are included the majority of pests attacking our staple crops grown over very extensive areas. In these cases the measures of control and prevention, however carefully and accurately may have been worked out, can only approximate to certainty in their results. With regard to most of the pests the knowledge may be said to be still in infancy and it is due to the paucity of workers, means and facilities for carrying on research. Investigation of a pest means an intensive study of the insect in its several aspects viz. in relation to the agricultural practices, climate, presence and absence of alternative food plant, the course of its life throughout a year, presence of parasites and other insects enemies. A thorough study of these is absolutely necessary to grasp the real nature of the pest and it is only after having made a thorough investigation can it be

found out whether there is any weak point in the life history of that pest at which it can be best tackled. Therefore, unless a particular insect that happens to be a pest on a certain crop is kept under very close observation over a series of years, knowledge about its behavior remains extremely defective and any recommendations based on such imperfect knowledge to combat the pest do not prove economic and effective. But under the present condition in most cases attempts are being made to fight the pest on the general observation and deductive references. Whatsoever little advance has been made in devising control measures in the case of staple crop grown over very large areas, such measures are not adopted by the farmers for want of faith, small uneconomic holdings, proverbial poverty and general apathy. Remedial measures to control pests on our staple crops consist mainly of cultural methods such as thorough and clean weeding, selection of pest resisting varieties, growing mixed crops, well devised rotation of crops, seasonal ploughing, flooding and draining. Again there may be such mechanical measures as netting choice fruits with muslin bags, bagging crops to collect grass hoppers smoking round the fields to drive away the pest temporarily. In the lay mind of the country farmer casual suggestions or methods of a cultural or mechanical nature, though very effective and economical in many cases fall flat and do not create as favourable an impression and spectacular effect as the use of drugs and other novel methods.

With regard to such control measures of crops which involve the use of insect poisons, it may be laid down that in India under the present conditation of Agriculture and even for many decades to come except in cases of some pests that effect, the paying crops like fruit trees, tobacco, tea, coffee, garden crops and kitchen plant on a small scale, are absolutely impracticable in every way. Such measures will never be found economical and less troublesome on account of the necessity of spraying out-fit able to control large areas and the prohibitive cost of insect-killing medicines. America and other western countries being large industrial countries can

produce manners and mineral insecticides from the by products very cheap as well as the different types of spraying machines from smal Americans pumps to power sprayers. Besides the cheap production of the necessary material, the outturn of the crops being many times more than what is obtained here, can afford to adopt such measures. But another important point which should not be ignored in comparing the western with the Indian agricultural class is the matter of literacy, which enables the Westerners to grasp and follow any scientific investigations more readily than is done here. Recently (1921) aeroplanes are being used in America and elsewhere for poisoning insects by dusting. Various types of aeroplanes are manufactured; they can go over the crops from 5 to 20 feet with a large carrying capacity in which tons of insecticides can be carried. But this method of control is yet in an experimental stage. In Indian Agiculture where the general use of spraying on the staple crops to destroy the pests is a very remote possibility, the use of aeroplanes is still more so.

(To be continued)

A Plea For Small Farming.

(R. A. Ramayya, L. Ag.)

VAST improvements have been brought about by the Department of Agriculture both in Europe and America and the Department of Agriculture in India is utilizing to a certain extent the scientific methods of agriculture, discovered in Western countries for the good of the people. But, any wholesale adoption of the methods in vogue in Western countries without any discrimination, will harm the cultivation in India, where an ancient system of agriculture is prevailing for thousands of years. As the conditions differ, naturally the particular method advocated in the West may prove disastrous when applied to a different set of conditions prevailing in India. Take for example the case of deep ploughing. It may suit very well the soils of Europe and America, but

may prove disastrous in this country. The question of large versus small farming is no exception to this rule. This question, of late, is occupying the attention of the English agriculturists. They are of opinion that the future of English agriculture lies, not in the direction of extensive, but in the intensive and small holding system. But, there were and there are, still, some people in India, who being dazzled by the glamour of Western civilisation, think that the only way to bring about economic and industrial re-generation is by the wholesale adoption of the Western system of large farming and implanting big factories and mills. It is absurd to imitate blindly foreign countries whose conditions are totally different from those prevailing in this country. I would, on the other hand, plead for small holdings, small farming and small cottage industries.

The well-being of a society depends upon the greatest happiness of the greatest number. This is possible only when every cultivator in the village is an independent peasant. India is an agricultural country with nearly 80% of the population solely dependent on agriculture, residing in the villages which number nearly 700,000. Hence, the population in the villages cultivating the soil, should have a holding to make peasant an independent. The conditions of Indian rural life are entirely different from those of other countries. Indeed, village life as known to India, has been a matter of pride, and any attempt to dislocate it, even unconsciously or through ignorance, by the conversion of the small holdings into large ones concentrating them into the hands of a few instead of many, instead of doing good to the village population, will do grievous harm and undermine what little corporate rural life has been still left, thus reducing an independent peasantry to the status of land serfs or landless labourers. The outcome naturally would be *Absentee Landlordism*, the cry for the abolition of which is rampant in Bengal with its Permanent Settlement system and in U. P. with its Taluqdari system.

Small farming and small holding is the method in vogue in this country for the last so many centuries. The Western system

of large farming and large holdings may have its advantages but it has got its own drawbacks which far outweigh the former and the introduction of which would be attended with far more disastrous results than they have been in the West. Large farming in the West has given an impetus to capitalism and every one is now aware of the baneful effect of capitalism carried to its extreme. The effect has been, fight between Capital and Labour, resulting in labour unrest, Socialism and the like. It means the exploitation of the few at the expense of many. The large farmers therein, care more for the return on their capital than for the welfare of the poor brethren who as a matter of fact are the producers of that wealth.

This, however is not the object of small farming, which method is in vogue for centuries past and which is more suited to our conditions in the East. The family of the peasant as a whole, works on the land and applies its labour, with the result that the cultivators are able to support their families, though they may not derive much of what an economist would term " Profit ". The formar, viz. large farming means maximum of profit to a limited few and latter, the minimum of profit to the many. In the former, the production may be cheap but the land supports only a small population; in the latter case the gross return is not great but a larger population lives on the land. Real prosperity in the village is not brought about by forcing the population to migrate into towns which can not absorb them and which cannot provide for them. It is certainly not by destroying their legitimate pride in the village, but on the other hand, the small independent peasantry can be made progressive and self-reliant, by providing them with sufficient capital, with agricultural cattle and better education. And it is no wonder, that of late the opinion in the West is drifting in the direction of small holdings.

The consolidation of small holdings of the many into large holdings for a few, would first deprive the hard working agriculturists of their sealed portions of land for which they have so

much attachment, so much so, that they regard their land as their life. The agriculturists will be turned into landless labourers. The question of unemployment has already become a serious problem and the creation of additional labourers, instead of doing good to the poor independent peasantry—the pride of our country—will add considerably to the wretchedness and misery of the poor people.

With the bitter fruits of the perpetual strife between capitalism and labour, as well as a closer study of the advantages of the small farming system, especially in China and Japan, the West is beginning to realise that it is the system of small farming and small holdings that confers the maximum of social well being on the agricultural classes, and labourers in general and that has enabled China and Japan to live on the land, whereas the adopting of an extensive system would have led to a chronic state of economic distress. One of the celebrated exponents of this opinion was the late Prof. F. H. King, an American writer. According to his account of the Agriculture of Japan and China—" the most highly cultivated European Country is a desert as compared with the close utilization of land in the extreme East. " That is how he summarised the lessons of Eastern agriculture. This great authority on agriculture, thus compares the Western and Eastern methods of cultivation which deserves the close attention of all.

" From the scientific point of view the lesson of Eastern agriculture, which it must be remembered has been carried on at almost its present pitch for at least 4,000 years, is the possibility of preserving the soil at a very high level of fertility without the introduction of any extraneous sources of plant food. Favoured by an abundant rainfall and very suitable temperature for vegetative activity, the Chinese cultivator is able to obtain two or three crops each season, time and space being economised by raising the plants in seed beds, carefully transplanting them so as always to keep the land fully occupied. Artificial fertilizers are of course, of only recent introduction, and the cultivators are in the main far too poor

to employ them even now. The only means of maintaining the fertility of the soil has been the most vigorous avoidance of waste and the restoration to the land of all the excreta produced by the consumption of the crops. The sewage from even the largest towns is carefully brought back to the land, so that whatever stock of plant food was in the soil to begin with is never permanently deleted but is maintained in continual circulation between the soil and the plant, the animal and the soil again, while several of the processes of cultivation are instinctively designed to bring into action the recuperative agencies of bacteria gathering nitrogen from the atmosphere.

Recently the Jamanagar Kumar after six years of absence in England and America to study Agriculture said to a press representative that Indian agriculturist knew from A. to Z. about farming and he did not need to be taught more. What is required is a regeneration from within, and not an imitation from outside.

It is said by the advocates of the Western method of large farming that it brings about a higher standard of living whereas the system of small farming has brought about a low standard of living in Japan. But, which is better—a lower standard of living which ensures subsistence to the whole of the population or a higher standard of living which pampers the few with the life blood of the many ? There can be only one answer to the question. Moreover this sliding down to a low standard of living may be appreciably prevented by limiting the state demand on land and leaving the small holders a margin such as would enable them to make provision in favourable years for unfavourable years, consequent on the failure of crops due to vicissitudes of seasons and other causes.

Modern Implements

Kartarsingh Cheema, L. Ag. A. E., Mecha. E.

Agriculture is decidedly the largest industry in India, which at present is seeking way out of the troublous times in which it finds itself and to which it has drifted owing to the apparently greater importance of the manufacturing industries, and through the apathy of the urban population. Some look to the Government for assistance, but the practical man sees that salvation must come from within the industry and strives to discover and introduce improved methods of production.

Factors necessitating change in the present method of Agriculture:

The first and the foremost requirement for a constant and healthy growth of any nation is an abundant supply of food. Food is required not only by the farmers but also by those who are not engaged in Agriculture. It will also be necessary if we wish to hold our position in the grain markets of the world. The earth can be made to produce ample, when the soil is tilled and plants suitable for food are cultivated. Over greater part of India agriculture is in a very backward state. Type of farming of the present day in India closely re sembles that which obtained in Europe two centuries ago, when the wooden plough representing the relic of the past was the implement in common use. With such an outfit the yield is doomed to be poor, and cropping larger areas without the aid of efficient implements and mechanical draught power, will ever remain a dream.

Considering the social development, we find the increase of population has been accompanied by a relative increase in the area under cultivation and by but little improvement in those methods of cultivation which will alone give an increased yield. The size of the farm remains small and the increase in the population is generally met by the increase in the number of farms. However, this state of affairs will not go on indefinitely. In the absence of any force retarding expansion, such as an invasion by the external enemies or the ravages of an epidemic disease, a time must come when

the farms at present isolated, become confluent and the expanse of unclaimed jungle reduced to the vanishing point. There will be thus practically continuous expanse of cultivation with only such amount of waste land as will be necessary for the supply of grazing the cattle, for the supply of fire wood and for such like purposes. As increased food supply will be no longer attainable by an increase of area under cultivation, exhausted lands will no longer be allowed in exchange for virgin soils, since no such land shall remain. We shall reach the time when the population must cease to multiply, or more must be obtained from the available land. The first of these alternatives is unthinkable, it is against what we have seen to be one of the premier instincts of all the living animals, and it is the direct stimulus supplied by this instinct that is responsible for the subsequent development of Agriculture, a development which leads to the production of an ever-increasing outturn from the area available.

Thirdly the economic conditions which are obtained in India to-day in several respects resemble those which led to the development of better farming in other countries. The price of the farm produce has arisen very much. Many industries other than agriculture are magnetising labourers from the villages to the manufacturing centres. There has been a general rise in the wages of both manual or intellectual labourers. If the landlords and enterprising men are to take full advantage of the new situation thus created, the use of labour saving machinery and better methods of cultivation cannot be neglected any longer.

In the earlier days several commodities of daily use were not easily obtainable due to the absense of transport facilities and safty of trade. People were therefore quite content with their lot. Since the introduction of stable government and settled conditions, land and its value of rental capacity went up by leaps and bounds. The increased demand of more land was met with by bringing virgin soil under cultivation. All these conditions brought money to the farmers, whose spending capacity and standard of living have consequently risen whereas another tendency which is, in general

finding favour both with the landlords and the farm labourers is to abate their effort and reduce the hours of work. This condition thus created should be seriously considered in order to save the main industry of India from the disastrous set back and total break down under the present conditions of struggle for existence.

Solution for the change.

1 Decreasing the cost of production.

(a) The land may be fertile or barren, the plough may be good or bad, but it is the man who counts for most in the long run. In the West Indies a farm labourer gets three times the pay of a labourer in India, yet it costs less in the former place to get a ton of Sugarcane cut and stripped, because the West Indian labourer does more than three times the work of the Indian labourer. Again take the operation of cotton picking. A woman in India will pick only one half as much as a woman in Egypt and one third a woman of the United States of America. In the case of very heavy work the inefficiency of the ordinary Indian labourer is very well marked. In California there is a good deal of competition in the matter of well boring between the hand borers and the power borers. It is admitted by both the classes that at a depth of less than hundred feet hand boring is the cheapest and that at depth of more than two hundred feet power boring stands the cheapest. In India, however it is found that at a depth of 100 feet machine power is the cheapest. It is due to the fact that the labour for heavy work is very difficult to secure and when got hold is very inefficient. In this class of labourers there exists a strong disinclination to do more work than their immediate necessities demand. It is a well known fact that when some one wishes to engage a daily labourer, then the labourer goes to the hut and asks his wife whether they have sufficient to eat for the day. If she says, "yes," he passes on to the next hut for a chat. It is also a fact, however that people will not go on paying the labourer more than it is worth, and in the present day some land owners prefer to let their land to the tenants rather than continue to work it, and improve it by hired labour, and give as their reason for so doing, that they cannot now get good labourers.—(To be continued)

Presidential Address Social Gathering.

Hon. A E. Nelson I. C. S.

Mr. Principal, Ladies and gentlemen, and students of the Agricultural College,

I have been invited to be present at your prize distribution to day in the absence of the Hon. Minister for Agriculture. I was glad to accept your Principal's invitation, for I have always been interested in the Farm and Dairy attached to your College, and among my pleasantest recollections, are the early morning walks round the farm in company with officers of the Department, like Mr. Evans, Mr. Clouston, Mr. Plymen or Mr. Allan himself.

We have all listened with interest to the report that has been read regarding the various College activities. The Report contains much that redounds to the credit of the College. Your connection with the University has made an auspicious commencement. Your report shows that the College is full of vitality. On one activity in particular I must congratulate you viz- the production of a College magazine. A copy of this was recently sent to me, and I consider it is a performance of which the College may be justly proud. Since your affiliation with the University, your College has made a leap forward; your numbers have been continually increasing, and I am told, that you are now uncomfortably crowded. I trust that the extension of the hostel system will have the sympathetic support of the Hon. Minister. It is a form of expansion, which, on educational grounds, should be welcomed by everybody, for it is a common-place that a student cannot realize to the full the advantages of education, unless he lives a corporate life, a life which teaches him the value of combination and co-operation. Living this corporate life, you should gradually free yourselves from those local communal and regional prejudices with which we are all liable to be afflicted. While members of the College, you will forget that you come from Berar or the North or South of the Province, you will develop a new patriotism, a new attachment, a new pride in membership of this corporate entity, the Agricultural College.

I should like to impress on you. students, how fortunate you are in having this opportunity to live a healthy life in such pleasant and open surroundings. A great philosopher described gardening as the purest of human pleasures. With gardening, I am sure, he would have associated agriculture, and you, students are blessed in being engaged in the purest of all works. To me one of the most other attractive features of your college is the manual work which you do in the fields with your own hands. What you are taught in the class rooms you apply in the fields. In highly industrialized countries it has long been recognized that the only road to a successful career in a great industry is to go through the mill from the beginning. and agriculture is the greatest of all industries, and should be no exception to the rule. I myself on one occasion took a short course in agriculture at an English Agricultural College, and I was much impressed by the daily sight of public school boys, many the sons of rich parents cutting hedges, tending cattle, spreading manure on the fields, in fact doing all the work of an agricultural labourer. And here I must take the opportunity of warning you not to pay too much attention to the possession of a University degree, for, if you do, the affiliation with the University will turn not to be a blessing, but a curse. Your Principal has given you some sound advice on this subject. I do not wish in any way to deprecate the value of a degree, but you must remember that your efficiency will depend, not on cramming for a degree but on your steady work throughout the year, and the reputation of your College will rest, not on the quantity of B. Ag.s it turns out, but on the quality and character of the men it produces. The important part of your education lies not in attendance at the lecture rooms but on the farm itself, the farm which you ought to regard as your own farm and in which you ought to take a personal pride. When you leave the College, your career will depend not so much on the possession of a degree as on the character you have formed by sharing in the corporate life of the College.

What is the nature of the work that lies in front of you? It is a truism that one of the best ways to uplift India is to increase her agricultural efficiency-in particular the wealth and well-being of this province are dependent on agriculture which is and is like-

ly to remain the greatest of its industries. To secure that development it is essential that a steady supply of trained and reliable agriculturists should be provided, and it is the function of this College to contribute to that supply. It should be the ambition of this College to send forth every year a band of young men who will carry the torch of scientific training into the villages–the knowledge and skill they have acquired here, they will apply for the benefit of their fellow agriculturists. You will, I hope approach your task with all humility recognizing that the Indian farmer is a practical man with generations of practical experience behind him, often possessing very slender capital which he cannot afford to risk without some assurance of success. You will, however, be able. I feel confident, to persuade even the conservative Indian agriculturists that they have still some lessons to learn. Some of you on leaving the College will perhaps secure Government or private service; many of you will go back to yout own or your father's land. Those of you who are fortunate to be landholders on some scale will, I hope, as the result of your College training, help towards a greater appreciation of what has been called the " dignity of agriculture." What I am sure the Agriculture Department would like to see would be the growth of a class of landowners imbued with the dignity of good farming, with the dignity of breeding pedigree stock and forming islands of high farming all over the province whose influence will react on the neighbourhood. Not only in improved farming should the influence of this College be felt; it should also be felt in a growing appreciation by the landlord of his responsibilities of his duties to his tenantry and his property. I trust that the larger landholders of the province will realize the advantages of the training given in this College and will send their sons here in increasing numbers. They will find that against this College, at any rate, the charge cannot be levelled that the education imparted is not altogather in touch with the requirements of the country.

I could not conclude without corgratulating the College on having retained Mr. Allan's services as Principal for another year. Mr. Allan has been connected with the College almost since its start in 1906, and in him the College was fortunate in finding a man who could throw himself into task with such energy and enthusi-

asm. He has laboured lovingly and unceasingly to bring the College to its persent position. With Mr. Allan I must associate the other memers of the teaching staff to whose relations with the students and to whose having been of the best teaching ability much credit is due.

Finally, I desire to congratulate those pupils who have won prizes this afternoon. To those students who are leaving the College, I wish success in their future career. May they be true to the traditions and examples set them in their College !

Cultivation of groundnut in Berar

(R. B. Ekbote, Senior L. Ag.)

BERAR has often been referred to as one of the great cotton tracts in India, and this is true since cotton is grown nearly on the two third of the cultivable land in Berar. Due to the suitability of soil and climatic conditions to cotton and the inflated prices, cotton was rapidly spread throughout the breadth and length of Berar. This rapid increase under cotton has taken place at the expense of wheat and Jawari. The area under jowar and other millets is reduced considerably and that under wheat and other rubi crops to a microscopic one. Forest and fallow land has been encroached upon and is now brought under plough and sown with cotton and in odd cases the compound in front of a bungalow has too been employed for growing cotton. The chief grain crops viz. Jawari is sown only to an extent as could meet the needs of local consumption and pay the wages of some of the farm labour. The rest of the holding of the cultivator is put down under cotton. In short cotton has spread on every possible inch of land.

The increase in area under cotton was followed by increase in its total output. The soil and climate being favourable the yield steadily increased. In the past years, with the exception of last

few, the prices of cotton remained sufficiently high and that cotton grower began to reap large and increasing profits. His purse began to swell. His wants multiplied. His standard of living increased. Social customs and ceremonies began to absorb heavy sums. Prices of the land abnormally went high. In short the financial condition of cotton growers was more than satisfactory.

The increased mania for cultivation of cotton along with above mentioned advantages has also brought in its train some evils. Due to the extension of area under cotton rotation of crops became defective. Cotton is now grown year after year on the same piece of land. This depleted the soil in "Nitrogen" a plant food constituent chiefly required for cotton. Due to the scarcity of cattle manure the received nitrogen is not replaced. There is no recovering crop that could enrich the impoverished scil. The out-turn, therefore, began to fall. Besides this the continuous cultivation of cotton on the same plot of land also brought some fungoid diseases and insect pest of cotton. With a cotton disease, boll-worm became rife and began to ravage the cotton plants. To add to these evils the prices of cotton in the past few years heavily went down and the days of Rs. 250/- for a khandi of cotton have now become a mere delusion. Naturally, therefore, to make the two ends meet there must be an attempt made to increse the yield of area per unit of capital. This can only be done by recovering the existing defects.

Of the many remedies that are to be suggested to rectify the aforesaid defects, good scheme of rotation is one. It is already said in the foregoing pages that the defective rotation is one of the causes that tend to lower the outturn. A good scheme of rotation of crops involve the cultivation of such crops as would renovate the soil, add Nitrogen removed by cotton and above all bring a fair return to the grower. The possibility of cultivation of ground nut therefore, is to be viewed from the above points of view.

Before entering into this consideration a question naturally arises that can groundnut be grown in Berar ? In Berar the anual

rain fall ranges from 20" to 25" almost all being received within the four months of monsoon. Groundnut is a kharif crop and can be grown in the area having the above mentioned quantity of rainfall. Secondly it requires from 3 to 3½ months for maturity and so within its period of growth there is no necessity of irrigation as the rainfall is received within that period only. Now the soil in Berar is heavy but well drained having plenty of lime and so is eminently suited for Groundnut. Experiments on Akola farm clearly go to show, as said before, that soil and climate are both suitable for Groundnut.

The important consideration now is whether groundnut is a paying crop and if so what would be the net gain, it would give, to the grower as compared to cotton. To arrive at this conclusion we must calculate the cost of cultivation of both the crops and from it estimate their net profits.

The following is the cost of cultivation of cotton on one acre.

(1) First Bakharing ...	1—8—0	(12) Second Hand Weeding	2—0—0
(2) Stubble removing ...	0-12—0	(13) Forth and fifth Hoeing	1—8—0
(3) Second Bakharing ...	1—2—0	(14) Watching	2—0—0
(4) Third ,, ...	C-12—0	(15) Picking	3--12—0
(5) Sowing	1—0—0	(16) Marketing	1—4—0
6) Light Bakharing ...	0 10—0	(17) Land revenue	2—8—0
(7) Cost of Seed and preparation	0--12—0	(18) Increament of ploughing and Manuring.	7—0—0
(8) First Hoeing	0--12—0		
(9) First Hand weeding ...	0--12—0		
(10) Second Hoeing ...	0--12—0	Total Rs....	31--12--0
(11) Third Hoeing ...	0--12—0		

Taking the average yield of cotton from 280 lb to 300 lb per acre and the price of the outturn at Rs 125/ per khandi comes to Rs 45to 48. Deducting from the amount the cost of cultivation of the crop the net gain would be Rs 13 to Rs 16 per acre.

Cost of Cultivation of Groundnut per acre

(1) Ploughing in February	9—0—0	(12) Plucking charges ...	11-11--
(2) First Bakharing ...	2—0—0	(13) Shelling charges ...	2—8—6
(3) Picking Stubble ...	1—0—0	(14) Night watching of the Crop for two months	3—0—0
(4) Second Bakharing ...	1—0—0		
(5) Sowing by Tifan ...	1—0—8		
(6) Cost of Seed 60 lb. nuts	5—3—0		
(7) Brushing the seed bed ...	0—5—4	(15) Land revenue	2—8—0
(8) Two Hoeings	1--10—0		
(9) First weeding	3—2—0	Rs: ...	55--14--2
(10) Second Weeding ...	1—9—0		
(11) Harvesting, pulling, tying bundles and stacking...	6—4—0		

Taking the yield of groundnut on the average from 1300 lbs. to 1600 lbs per acre the cost of the outturn at the rate of 16 lbs. per rupee (excluding the cost of the tops) comes to Rs 81 to Rs 100. So the net profit per acre deducting the cost of cultivation would be from Rs. 27 to Rs. 46.

It will thus be seen that goundnut is not only a paying crop but highly and distinctly more paying as compared to cotton as long as the prices of cotton remain below Rs. 150 a khandi. So viewed from the economic point of view also groundnut answers our purpose best.

Groundnut belongs to the natural order of Leguminoceai and is therefore a renovating crop that could fix the atmospheric Nitrogen and add this to the soil. Thus the soil by Groundnut cultivation be getting much the nitrogen removed by cotton and would not thus be impoverished. The succeeding crop is therefore bound to be benefited by this addition of nitrogen and this will be seen by the increase in the outturn. So viewed from all points of view Groundnut suits our present needs.

There is a great demand for Groundnut from outside countries. The nuts are used for local consumption and as well the oil is expressed from the nut. The cake makes up a good cattle food and manure. Tops are succulent and nutritive for feeding the cattle. The demand for groundnut therefore is bound to remain bright and prices high.

In the cultivation of Groundnut therefore is to be found partial solution for many of the evils that accompany the continuous cultivation and the low prices of cotton. It has thus opened a great vista for Berar cultivators, who the writer hopes will realise the value of Groundnut crop and take to its cultivation on a certain area of their holding.

The Law that the Farmers ought to know

S. B. Karkarey M. A. LL. B.

On any railway visit a first class bogey or a second class compartment at night, the occupants as a rule, will be seen comfortably seated on the cushioned seats under the dazzling light of half a dozon electric bulbs with a couple of fans working over their heads. There are the toilet rooms, the lavatory and the other conveniences of home. Now just enter a third class and the scene that greats one is appalling. There is hardly any room to stand, so overcrowded is it with men women and children, luggage of every description, bundles of long sticks, grind stones, brooms, dyed yarn, and packages emiting out all sorts of foul smells. As matters stand these public carriers serve as convenient carriers of most terrible forms of disease. They are a great help to the numerous epidemics now raging in this land.

This miserable condition is due to the ignorance of the passengers of their rights and duties on railways. If they knew they would not allow the dirty heavy luggage to be brought in, nor would they admit the excess number of passengers when the legal maximum capacity of the carriages is reached.

Leaving the matter of luxurious ways of travelling in higher classes apart, if the farmers, who form the bulk of the third class passengers, saw their rights enforced and duties carried out, most of the inconveniences would disappear and railway journey in the third class, under the existing condition, would be healthy and comfortable. The literature on the Railway Law is enormous. Resolutions, rules and orders are being issued almost daily and by-laws are framed as occasions arise and the law reports of various High Courts are replate in the decided cases and the hard worked farmer educated though he be cannot be expected to wade through all this,

Now they ought to know firstly that everyone is a passenger who undertakes with the consent of the carriers to travel in the

convenience provided by them otherwise than in the service of the carriers as such. If he has purchased a ticket he is a passenger even before he has boarded the train.

The Railway companies are common carriers because they exercise the public employment of carrying passengers and they are bound to receive all passengers who accept their terms. Although as carriers of passengers the Railways are not insurers, but they are bound to exercise the greatest care and forethought for securing the safety of their passengers and are answerable for the smallest negligence on their part of their servants and agents but not unforeseen accidents which care and vigilance could not have provided against or prevented.

A railway company does not warrant that everything they necessarily use in the conveyance of passengers is absolutely free from defects likely to cause peril but they are bound to protect its passengers from injury from what ever source arising as far as can be secured by such reasonable precautions as human judgement and foresight are capable of. The duty which the carrier owes to its passengers as such begins the moment the passenger becomes such and lasts until he ceases to be a passenger. and the liability is not limited to ordinary injuries, it extends to physical violence and oral insults inflicted by its employees.

Every railway company must provide and maintain in good working order in every train worked by it which carries passengers and travels more than twenty miles without stopping, efficient means of communication between the passengers and the servants of the company in charge of the train. Every railway administration has to fix the maximum number of passengers which may be carried in each compartment of every description of carriage and must exhibit the number so fixed in a conspicuous manner inside or outside each compartment, in English or in one or more of the Vernacular languages in common use in the territory traversed by the railways.

Railway companies contract to carry the passengers inside their carriage.

The railway companies are liable for negligence to persons who come to their station on business, or who come to see passengers off, to all persons lawfully on any part of their premises for any injury caused by negligence on the part of the company or its servants although they are not liable for the acts of those over whom they have no control. If a drunken man for example, assaults a passenger and the fact that the man was drunk was not within the knowledge of the ticket collector who admitted him, the company in this case will not be responsible.

Although a railway company is not liable for injury to trespassers, those who board a train to get a gratuitous ride, they are under a duty to take reasonable care for the security of persons to whom an inducement or invitation is offered to come upon the premises of the Company for instance, the intending travellers, workmen performing a contract with the company or consignees helping the company to unload their own goods. A railway company having running powers over another company's line is liable to passengers for injury from collision though it was owing to the servants of the other company. Even if a passenger agrees to be carried at his own risk the railway still remains liable for criminal prosecution.

The company is liable for negligence when an accident happens to a railway either by a carriage breaking down or running off the line; a passenger receives injury in an accident occasioned by a train running in dark against another train or buffers permanently created on a station, when the open door of a moving train strikes and injures passengers on the platform or when a train is run at 40 to 45 miles an hour through an incorporated town where the presence of persons may be anticipated.

It is also liable where sufficient time is not allowed for passengers to alight and the train is set in motion whilst they are alighting, where engines blow off steam with great noise at leval crossing and injures bystanders, or where an animal gets on to the lines through a gate out of repair and is injured, where the company fails to examine that the trucks are in a state to travel safely.

When notices put up by a railway company forbidding persons to the line at a particular point have been continually disregarded by the public and the company has not taken steps to enforce their observance, in case of injury to any one crossing the line the company is liable.

The company is also liable when a passenger gets injured by falling on steps leading to railway station, which has become worn out and slippery by use. If a passenger gets injured through bad lighting or cleaning arrangement, say by stepping on banana skin, when a passenger gets injured because there is a space of two feet between the foot board of the train and the platform, where his eye is injured by a spark from an engine, where the passenger in the act of getting in or out of a carriage gets his fingers squeezed when a train starts without warning and passenger's hand is injured by the closing of a sliding door, or accidents happen through doors flying open, when a passenger falls down there being no platform on the station, when the train overshoots the station and does not warn the passenger against alighting, when an accident tackes place on account of train stopping at dangerous places the company will be held liable.

What We saw on the Experimental Farms.

N. B. Pandhare, Senior L. Ag. class

To gather first hand information regarding the cultivation of various crops in the provinces in different tracts and under varying conditions of soil and climate, we were impatiently awaiting the day on which we would start on our Agricultural Tour. The object of the agricultural tour is to make direct observation of the improvements made on the Government farms. While travelling we have opportunities of observing crops grown on wider scale in the different tracts instead of confining our knowledge to the small plots at the College.

We left for Raipur on the 29th of October by the night Express. In the train every one of us was comfortably seated, but we could not enjoy sound sleep. Any way we reached our destination at 6 in the morning and went to Labhandi farm. Raipur Experimental Farm is situated on the Great Eastern road 5 miles east of the town of Raipur. It encompasses an area of 229 acres, 40 of which are under pasture. In the cultivated portion of the farm, the three main crop-bearing soils of the district are well represented viz. Matasi, Dorsa and Kanhar. The last named resembles the black cotton soil of Berar but is more tenacious and there fore more subject to water-logging, during the rains. It is difficult to work during monsoon period and therefore the land is generally reserved for rabi crops. Dorsa is lighter in texture and Matasi is a sandy loam which produces excellent crops of rice when irrigated.

A special feature of this year's tour was a close study of geological formation of soils. No sooner we step in farm compound than we observe the paddy fields covered with luxuriant growth of the crop. This year was very favourable for paddy and hence it showed exceptional growth. Different varieties had prominent characteristics of their own and could be recognised very easily on field scale. We could study the characters of the different varieties better than in class rooms. Here paddies are classified into three main groups according to their time of ripening.

(1) Early variety—Bhata gurmatta.
(2) Medium variety—Bhondu and Parewa.
(3) Late varieties—Gurmatia, Chinoor and Luchai.

Different experiments on manures of different types that is san-hemp, farm yard manure, urin, earth, bone-meal, Super phosphate are caraied on. The average of 7 years result has shown that 8,000 lbs. cattle dung and 240 lbs. of bone meal are most profitable. We marked Chinoor the finest variety of paddy. It has given 2,000 lbs. of yield per acre and when grown on light soil there are no awns and while on heavy soil there are awns. Other varieties from different localities are also grown namely

Gurmatia, Karia Gurmatia, Pandhari, from Balaghat, Laxmi Bhoja from Bilaspur, Budhia-bako and so on. It was now 11 A. M. and we hurried to the farm office and saw pre served specimens. After that we dispersed.

We went to the adjoing small tank to remove our fatigue. The tiny ripples on the limpid water were gently kissing the tank. We swam in the tank and then enjoyed delicious meal. Just after an hour we motored to Chandkhuri farm. While passing, we observed on either side of the road patches of laterite soil.

The farm is situated at a distance of 15 miles east of Raipur and is accessible for the last six miles by a murrum road which joins the Great Eastern Road. The soil here is mainly of a thin gravel type known as 'Bhata' which is so very extensively found in the circle. Formerly this class of soil was considered by cultivators to be fit only for growing the lesser millets-kadon and kutki-at intervals of three or four years. Experiments have shown that given manure and irrigation, this soil is capable of growing paying crops of ground nut, sugarcane cotton and fodder like juar and clover and that groundnut can be raised even without manure. The farm is irrigated from Kurud tank which is fed by the Mahanadi canal.

As it is a seed and demonstration farm, seeds of different crops are propagated and demonstrated to the cultivators. The special feature here is that Sindewahi cross is tried with fair result. Coimbatore varieties are grown also and distributed to the cultivators.

With the Superintendent we proceeded to farm and studied the farm lay out. It is a rectangular block, if grazing area be excluded. Grass experiments are in progress on Shukla grass, other varieties being grown on extensive scale.

We visited the paddy fields of some private owners and could compare the crops and found that they made great progress but their crop was composed of heterogenous mass of all kinds of varieties and especially Karaga which does a lot of damage to the crop and depreciates its value.

The Superintendent entertained us well and then we left the place. On our return journey we saw herd of cattle which was typically Chhattisgarh type. They were seen emaciated, short, prehensiling poor grass, growing on Bhata and which has got low nutritive value. At last the sun came down on the horizen. The western sky blushed in to golden hue and after a while darkness seemed to steal through the fading rays.

Just after dinner we were due for Raipur in the same motor, at 7-30 we left Labhandi and reached Raipur at 8 P. M. We lodged ourselves in Sarai near the station to pass the night. We were huddled up in a single room and indeed we were put to a lot of inconvenience but we did not mind. Just in the morning at 6-45 A.M. we took train for Balaghat where we arrived at noon.

Directly we proceeded to Waraseoni farm. If we study the geological formation of the soil, the rocks from which the soils are composed comprise of, laterite, deccan trap, lameta felsite and basic intrusives, granite, gneisses, anp chrystalline schist. The rocks comprising this series usually have moderate to steep dip and consists of sand stones, grits, conglomerates and shales. Nine kinds of, soils that we find, are kali, kanhar, morand, morand/II, mutbarra, sihar, retari, bardi and kachhar.

This is an ideal farm with a good lay out into rectangular blocks. Experiments on sugarcane manure are carried on in case of Coimbatore varieties. Paddy is the second important crop. Chinoor is regarded as of special value. In manurial experiments Nitrogen is given in different forms, oil cakes, ammonium sulphate, sodium nitrate etc and relative merits are found out.

Selection work is going on local rice. Some of the varieties grown are luko, ruibuta, piso. In paddy fields (bandhies) when the crop is standing the lakhori at the rate of 300 lbs per acre is broad casted as Utera.

There is good plantain cultivation and plantains of different kinds are grown. They manure the plants at the following rate. oil cake: ammonium sulphate: potassium sulphate : : 3: 1: 1

There is a very good orange garden but some of the trees were attacked by fungus. The geological formation is divised into, alluvium, laterite, deccan trap, intertrappeans lametas metamorphic and crystalline complex.

As this farm is recently opened, the area is not even. We noted the effect of 25 cwt loans of night soil on cotton, (Saugor/Jadi) but learnt that the yield was not commensurate with dozes of concentrated manure.

Then we went where wheat was sown by Nari plough. The cultivator in this case begins sowing abruply and at each time only one line is sown. On the other side Mc Cormic deering was working and naturally we compared the results at the spot. The latter is eight times more efficient than the former. At one time five lines could be sown. There is a spring arrangement in the deering and any obstruction can be surmounted.

The speciality of the farm is Papaya cultivation. It has been counted by the Superintendent that each tree bears on average 60 to 100 fruits and the market rate is 2 as. per fruit. The trees are planted in 1½–3 and for every tree 2 baskets of cattle dung are added. It is a paying business and on a small scale it is worth a trial.

After our meals, we hurried to see a private estate, ten miles off from the farm. We observed the condition of Sugar cane, orange garden and asked many a questions with regard to nursery of paddies, cultivation of Nagali (Guizotia-oleifera) They pluck fruits from the trees very early and we advised them not to take fruits so soon. Also we explained the stage at which sugarcane shows symptoms of ripeness. We learnt that Nagli is grown on Bara soil which is reddish coloured gravel, thickly strewn

with large stones and which is easily exhausted and requires frequent fallows. Next we visited local Industrial factory where Persion wheels Gur boiling pans, Winnowers, Threshers, Grain storage bins, Water barreks, hoes for cotton, prunning sticks are manufactured on economic scale. We saw the Persion wheel working efficiently. Public support and encouragement in needed in this direction.

We then left for Chhindwara by Motor car. On the way we observed the cultivation of various crops. Near Chaurayii we saw juar, soybean and tur sown together.

At Chhind wara we walked round the farm and saw the orchard in a very good condition indeed. It consists of hetero genous types of trees plums, apricots, pomgranate, pomelo and may others. The rocks are composed of deccan trap, gondwana, metamorphic, and the soils are formed from gneise and felc-ite which are components of the granite rocks.

On the same night we left Chhindwara and reached Nagpur at 10 A. M. on Thursday the 3rd November and were once more in the city bustle.

Grand Papa's Methods of Pest Destruction

MY brother is a doctor of some repute in the locality where we reside. Our quarters are surrounded by the once depressed but now 'favoured' class the mahars. Naturally if anything goes amiss the folks run to us for help. It was a summer eve and we were siting in our parlour. Presently came a neighbour asking for medical help. The doctor was away on a distant visit. I did not wish to let go my brother's patient to another doctor. On enquiry I learnt that there was a case of scorpion bite. I had read of the famous scorpion charm figure and had seen the dia-

gram in the Webster's Dictionary too. ' Here is an opportunity, let me try the efficacy, ' said I to my self and forthwith accompanied the man with pen and ink in my hand to write out a prescription as if. Without lifting my hand I drew the figure on the bare leg of my patient and asked him where the pain was. To my surprize the patient located the pain at a much lower place than where I had scribbled the diagram. Evidently the poison was descending and the pain abating. As I repeated the process half a dozen times the patient felt immensely relieved and I walked out of the hut with a deal of self satisfaction.

The marbot procession which is so much responsible for the communal troubles in Nagpur is said to be a charm devised to destroy pests, like bugs, masquitoes and the like. It is not we alone who believe in these crude and queer remedies but mankind it seems, all the world over. Some of the ways still current and others no more existing may prove interesting to our readers.

Plague has become our regular visitor and the doctors say the rats are the cause of the disease. With all their ingenious efforts of catch and kill Dr. Sen —thank God the work does not make him insane—and his health staff have been so for unable to word off the unwelcome guest. To destroy the rats in towns and villages the Philistines have a suggestion to offer. ' Make a gold image of a mouse and send it out of the town in a new cart drawn by two cows ' or try what a Greek treatise says for mice expulsion. Take a sheet of papar and write ' I adjure you, ye mice here present that ye neither injure me nor suffer another mouse to do so. I give you yonder field (specify the field) but if ever I catch you again by the mother of Gods, I will rend you in seven pieces. Write this and stick the paper on an unhewn stone in the field before sunrise taking care to keep the written side up. Ardennes repeat the following words ' *Erat Verbum, apud Deum Vestrum* ' male, rats and female rats I conjure you by the great God to go out of my house, out of all my habitations, and to betake yourself to such and such a place there to end your days

Decretis reversis et desembara sis Virgo potens Clemens, justitiae Write the words on pieces of paper fold them up and place one of them under the door by which the rats are to go forth and the other on the road they are to take before sun rise. Some run round their fields saying, Pruner is your name, creep not through my rice. Be blind, deaf, creep not through my rice. If you must creep through rice go and creep through other rice, or Pruner is your real name, mouse is your byname, down in the evening land is the stone on which you ought to sit. In the West in Java is your abode, or O Longtail, longtail, eat not my rice. It is the rice of a prince. It is the field of one who is revered. In the East Indies, large number of mice are caught and burnt as corps are burnt but two captured mice are allowed to live and receive a little packet of white linen. People allow them to go bowing before them as before gods.

Some of the East Indians on a Friday after the usual service in a mosque is over, solemnly unite four pairs of mice in marriage Each pair is then shut up in a miniature canoe about a foot long. These are filled with rice and other fruits of the earth, then the four pairs are escorted to the sea shore just as if it were a real wedding. Just as the procession passes, the people beat with all their might on the rice blocks. On reaching the shore, canoes with their little inmates are launched and left to the mercy of the wind and the waves.

A Saxon sower of Transylvania in order to keep sparrows from the corn, begins by throwings the first handful of seed back wards over his head saying 'That is for you sparrows' probably resembling the Hindu Brahmins daily offerings to Chitra, Chitragupta, Yama, Yamaduta and the various Bhootas. The Ibans of Sarawak catch one sparrow, one grass hopper and other destructive birds, put them in a tiny boat of bark well stored with provisions and then allow the little vessel with its abnoxious passengers to float down the river.

The arrival of a swarm of locusts is dreaded by the farmers as much as, if not more, the ravaging of plague by the town and

city people. The old entomologists of German East Africa caught one of the locusts, tied its legs together, charged the creature to lead the swarm to the land of the neighbouring and hostile chief and let it fly away. Even in our own South Mirzapur when locusts threaten to eat up the fruits of the earth, people catch one, decorate his head with a spot of red lead, salamm to him and let him go. The Albanian women to save their fields and vineyards from locusts and beetles, assemble with disheavelled hair, catch a few insects and march with them in funeral procession to sp'ing or stream and drown the creatures, one of them singing ' O Locust and beetles who have left us bereaved' and the dirge is taken up and repeated by all in chorus.

Caterpillars are another pests of a general kind. The Germans freed their gardens from caterpillars thus After sunset or at midnight the mistress of the house or another female member of the family walked all round the garden dragging a broom after her. She was not to look behind her and she kept murmuring ' Good evening mother caterpillar; you shall come with your husband to church.' The garden gate was left open till the following morning. The Matabele find caterpillars in their fields, put an ear of corn in a calabash, fill the vessel up with caterpillars and set it down on a path leading to another village, hoping thus to induce the insects to migrate thither, others of New Guinea, imagining the caterpillar and worms animated by the soul of human dead, politely request, them to leave the field saying, ' Ye locusts worms and caterpillars who have died or hanged yourselves or have been killed by a falling log or devoured by a shark go into the village. In Syria a virgin became the mother of the caterpillar that was taken. She and other virgins bewailed and buried it. Then the mother was taken back to be consoled.

In these and similar queer ways are pests infesting various localities of different countries, destroyed. To guard the corn against the attack of leaf flies, a farmer shuts his eyes and scatters three hand fulls of oats in different directions or after a farmer has finished

sowing, the sower goes once more from end to end of the field imitating the gesture of sowing but with an empty hand saying 'I sow these for the animals. I sow it for everything that flies and creeps, that walks and stands, that sings and springs in the name of the god the Father.' Russian girls on 1st September make small coffins of turnips and other vegetables enclose flies and other insects, in this and bury them with a great show of mourning. In some parts a twin girl accompanied by a woman of mature years carries the beetle in a calabash without speaking a word to anyone. At her back march a whole troop of women, their arms, heads, waists covered with grass holding in their hands branches of manioc waving them and chanting 'Nanoo go away, Leave our fields; Nanoo go away. Leave our fields' The little girl throws her Calabash with beetles in the water without looking behind her. Thereupon women bellow out very obscene songs. Scorpions were driven out of Antioch by making image of a scorpion and burying it under a small pillar in the middle of the city, so was also Fez cleared of scorpions by making an image of a bird with a scorpion in its beak.

Co-operation.

If the educated classes work with honest motives in co-operation with the land owners of the country and take up agriculture, cattle breeding and dairy farming in right earnest, they can make a fortune for themselves and do a lot of good to the country.

A 'Góséwak' is not easily made, certainly never for the wishing. He has to study his art as much as an engineer, or a lawyer or a doctor.

Economics or rural leadership is after all less exciting and attractive than leadership in other fields. But it is by no means of less value or importance. Upon the rural re-construction of India depends the entire future of the country.

The watch-word of every well-wisher of Indian Agriculture should be co-operation in every detail of work.

The March of Events.

THE British museum had arranged an exhibition of printed books and manuscripts to illustrate the history of agriculture. These rare exhibits covered a range of about 5000 years. A student of the history of agriculture will be able to learn that harvesting threshing fruit culture, irrigation, tenancy laws and government regulations with regard to live stock returns are no new things. Scientific agriculture has its roots deep in the past. Old farm accounts, labour disputes incorporated in documents and the destructive pests recorded in ancient records, all say that we are confronting the same problems as the vanished civilization. To quote only a few examples out of the many, the implement of tillage, say a primitive hoe was developed into the plough by a simple enlargement of its parts and the extension of the handle into the beam. A vignette from the Funerary Papyrus shows us the cultivation of the date, the fig, the grape in a garden surrounding a tank in sandy soils where pits were dug and filled with Nile-mud. The implements employed in the middle ages were of the simplest. Fitz Herbert's book on Husbandry was the first agricultural treatise to be printed in England. The seventeenth century saw the beginning of mechanical invention and carried further the advocacy of manures. Edward Maxey, John Worlidge and Jethro Tull, introduced the idea of drilling, an instrument of corn sowing and horse hoeing. Our readers may not have been able to see the exhibition but are advised to have the guide–a wonderful shillings worth.

Seeds are the foundation on which farm and garden crops are based. In our country very few farmers and seed sellers realise their heavy responsibility. To safeguard the farmer and the gardener from the machination and carelessness of irresponsible and ignorant seed sellers, the British Government passed the Seed Act of 1920 and the operation of the Act has resulted in general improvment in the quality of seeds marketed in Great Britain.

In Queensland good farming, is a safe and sound business. We do not yet regard in India, agriculture as a well rooted industry but as a hand to mouth, year to year proposition.

A marketting school for farmers was held recently at Storres Connecticut to make it possible for those who bear the responsibility for control and guidance of cooperative marketting, to receive instructions from men of national reputation and to bring the most promising and able of the young farmers into contact with the present leaders of cooperation.

Clean milk competitions are common in England. During these contests surprize visits are made by the judges and their comments forwarded to the competetors. These contests set an example to all producers of milk and give the consumer confidence in the milk supply as they read the articles and notes in papers.

The first Inter-national Congress of Soil Science met in Washington June 1927 under the presidency of Dr. Jacol G. Lipman of New Jersey Agricultural Experimental Station. President Coolidge welcomed about 400 soil scientists who read papers on soil classification mapping, and examining. Dr K.-Glika of Leningrad is elected president of the next congress to be held in Russia in 1930.

The first award of the Maynard Gangaram Prize of the value of Rs. 3000 will be made for the discovery, or an invention or a new practical method which will lead to increased agricultural production in the Punjab on a paying basis. Applications for the award should reach the Director of Agriculture Punjab by 1st January 1929.

Dr. H. E. Annett and A. R. P. Aiyar say that when old roads on which grass is over grown are ploughed up and taken in cultivation, the crop on the area is much larger than on land under continuous cultivation, showing that when cultivated land is allowed to run wild, an accumulation of nitrogen takes place.

The colonization scheme of the Mysore Government to wean Kumri cultivator from his Kumri profession and induce him to permanant settlement has met with great success. In 1926, eight new families consisting of 30 members were added to the number of settlers which amounted to 1379 on June 30. 1926. They have cottage industries, itenerent teachers and Co-operative Societies.

* * *

According to the standard adopted by the ministry of Health in Great Britain 'certified' milk which is of the highest grade must contain less than 30,000 organisms per cubic centimetre. Systematic bacteriological examinations made daily over several years have shown that the milk sold from the Dairy of the Imperial Agricultural Research Institute at Pusa, has reached this high stan dard. The number of plate counts in milk has been found under, Indian conditions to reach the maximum in the monsoon, but the highest average in 1926-27 for the month of July was only 26.500 There is no cooling or pasteurizing plant in the Pusa dairy. This desirable result has been attained by strict insistence on cleanliness, the use of covered milking pails and the sterilization of all utensils Commercial dairies in India can thus produce 'certified' milk with out laying out much capital. The details of this investigation are to be found in Pusa Bulletin No 170 which is available from the Central Publication Branch. Pcst—Box 2078 Calcutta for annas four only.

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Speaking on the Berar Land Revenue code, on the question of ownership of land in Berar, the Legel Remembrancer said the British conception that was and is being maintained is that the ruling power has in conformity, with the ancient usages of the country the actual proprietory rights of land of every description.

Principal R. G. Allan, we understand is going to Hyderabad state to inspect lands that are to be farmed on large scale. Mr. Wallace, the Deputy Direction of Agr. Southern Circle will officiate during his absence.

Agricultural Association

The annual meeting of the Agricultural Association was held in the College hall on Sunday the 28th August 1927 when Mr. C. M. Trivedi, Director of Industries and Registrar, Cooperative Societies delivered an interesting lecture on Cooperative Credit.

The learned lecturer first traced the origin of the Cooperatitive Societies and said that it was in the latter half of the 19th Century in Germany that two kinds of systems arose—Raiffeisen which dealt with the rural population and Schuldetz restricted to Urban population. He emphasised that the people themselves, independently of the help of the Government took the lead in that country and came to the rescue of indebted peasantry. He then traced the development of the Cooperative movement in different parts of the world and briefly dealt with credit, sale and supply Societies. He then came to the development of Cooperative movement in India and said that it was the Government in this country who took the lead in this matter. He expressed his regret that the illiteracy of the country was greatly hampering its rapid development but hoped that we may well see in it a message of hope to the indebted agriculturist who is entirely in the clutches of the moneylender who so to say, eats the very marrow of their bones

The next meeting of the Association was held on 26th Nov. 1927 in which the motion "Export of oil seeds of India is to the best advantage of an Indian Agriculturist" was moved by Mr. R. J. Kalamkar. Mr. R. B. Ekbote opposed it. Mr. S. G. Kolte spoke third and Mr. N. B. Pandhre spoke forth. The debate became very enlivening indeed and a good enthusiasm was shown by the students in the discussion which followed. The motion was lost by an over whelming majority.

The third meeting of the Agricultural Association was held on 7th Jan. 1928 when Mr. N. B. Pandhre read an interesting paper on the work of the Agricultural Department on economic crops of C. P. and Berar.

LIST OF PRIZE WINNERS FOR THE YEAR 1926-27.

Names of Prize winners.	Names of Prizes.	Awarded in
Fourth year.		
1 Aliyar Khan	Director's prize.	General ability.
2 B. D. Mishra	Smythies Chemical *Medal*	Chemistry.
3 N. K. Pillai	Special Prize for Botany	Botany.
4 Aliyar Khan	Special Prize.	Entomology.
5 P. S. Sahastrabuddhey	Special Prize for Agricuture.	Agriculture.
6 D. V. Subba Rao	Kedarnath Rai *Medal.*	Agril. Engineering.
7 D. Das Gupta)	The Napier Essay Prize.	Prac. Agric.
8 R. N. Gadre)		
9 D. Das Gupta	Special Prize in Vety.	Veterinary.
Intermediate in Agriculture.		
10 R. J. Kalamkar	Class Prize.	General Efficiency.
11 S. K. Waishampayan	Special Prize Sec. I	Agriculture.
12 A. N. Karnik	,, ,, ,, II	Maths. & Survey.
13 R. J. Kalamkar	,, ,, .. III	Elementary Science.
14 R. J. Kalamkar	Chowdhury *Medal.*	Prac. Agriculture.
Second year Certificate.		
15 R P. Verma	Special Prize for certificate course.	General Efficiency.
First year Degree.		
16 K. M. Simlot	Class Prize.	Total Aggregate.
17 R. P. Upadhaye	Special Prize Sec. I	In Agriculture.
18 K. M. Simlot	,, ,, ,, II	In Maths. and Survey
19 N. G. Sirpurkar	,, ,, in Prac. Agric	Prac. Agric.
20 Hatim Ali	Phatak's Agriculture Prize.	Agril. efficiency.
21 R. G. Astikar	Special Prize.	Dairy stock judging.
First year Certificate.		
2 N. B. Pradhan	Special Prize Certificate course.	General efficiency.
23 B. L. Kajway	Special Prize.	Dairy stock judging

SPORTS PRIZES 1927-28.

Items.	First Prize.	Second Prize.
1. 100 Yards Race.	R. A. Katakwar.	N. A. Khan.
2. Sack Race.	D. V. Mahajan.	R. J. Kalamkar.
3. Hurdles.	R. J. Kalamkar.	V. H. Limaye.
4. Long Jump	R. A. Katakwar.	V. H. Limaye.
5. Putting the shot.	N. A. Khan.	A. B. Dutta.
6. Sack Millie.	N. A. Khan.	
7. 440 Yards Race.	R. A. Katakwar.	A. B. Dutta.
8. Bullock Race.	N. G. Sirpurkar.	
9. Three legged Race.	Niranjan Pertab & B. G. Chandel.	R. G. Joglekar & R. P. Uplapwar.
10. Obstacle Race.	N. B. Pradhan.	W. R. Dhodapkar.
11. Slow Cycling.	Altaf Ahmed.	
12. One Mile Race.	R. N. Kner.	N. G. Sirpurkar.
13. Relay Race.	R. A. Katakwar. D. G. Kherdekar. M. G. Moghe. Altaf Ahmed.	
14. Gymnastics.	D. R. Dhodapkar.	B. S. Tyagi.
15. Carem.	W. P. Lakhkar. & J. R. Pal.	S. G. Selot. & N. K. Ghosh.
16. Ping Pong.	W. P. Lakhkar.	D. N. Das.
17. Chess.	H. N. Sharma.	N. Pratap.
18. Tennis Doubles.	N. Z. Ahmed & A. K. Chatterjee.	

The Nagpur

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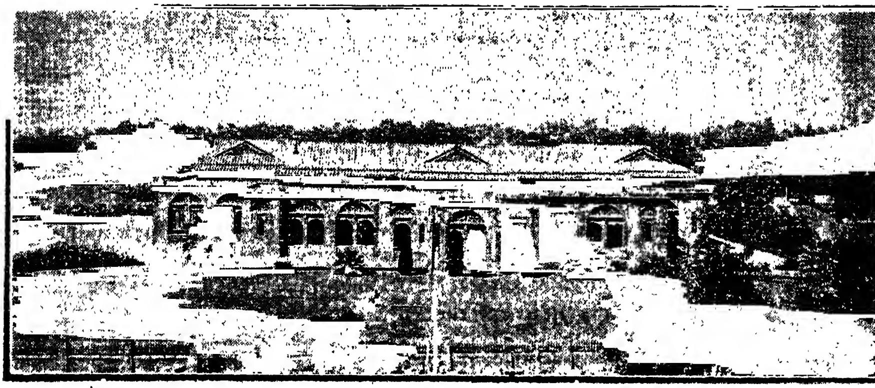
Editor,
Nagpur Agricultural College Magazine.

Agricultural College Magazine.



Our Research Institute.

Vol. II No. 4. MARCH, 1928.

Editorial

On the eve of our retirement from office, we the members of the Magazine Committee thank all those who co-operated with us to shoulder this heavy burden of work to yet another mile-stone. While conscious of our shortcomings, we have done our best. We lay down the reins of this honourable administration with fervent hopes that the incoming office-bearers will do all to advance the interests of this particular activity of ours for which we had the rare honor of being congratulated by the Finance Member at our last college day.

* * *

This years results that appear elsewhere in these columns were already foretold; yet the students need neither be discouraged nor frightened. It is not uncommon for Providence to favour us with such visits occasionally, and this is perhaps nature's remedy to set things right and must not be despised when normal working is to be restored.

* * *

Mr. S. T. D. Wallace, our officiating Principal, proceeded on leave after a very busy period of work during the examination fort night. Mr. Allan has returned from Hyderabad deputation and is again amidst us.

Some Village Agricultural Proverbs.

(R. N Misra, M.Sc.)

Where the appearance of a tractor is a wonder, where engines and machines may be regarded as living beings, and where the modern improved methods of cultivation are yet unknown the peasants' knowledge of Agricultural Science depends upon their hereditary traditional methods taught by father to son supplimented with a number of old proverbs written on the pages of memory and handed down from generation to generation only verbally on special occasions. These proverbs, if studied carefully and searchingly, may give some clue to the agricultural knowledge possessed by the Indian agriculturists in villages. This unwritten literature has gradually developed by the practical experience gained in course of many centuries.

The village proverbs are not all of them educative. Some of them deal also with the prevalent superstition, while others are mere humorous and cause temporary diversion. They are important also historically as they throw good deal of light upon old customs and manners; and sometimes refer to certain historically important occurences, and their noteworthy details, the knowledge of which would otherwise have been lost for ever.

It is therefore, hoped that a perusal of some of these proverbs would be interesting to the readers, and may suggest some of them to make a closer inquiry of them. It would also be interesting if proverbs of other dialects of the province find publication in a similar way.

The proverbs prevalent amongst the village peasantry may be classified under three headings:—

(1) Religious, Social, political and metaphysical.

(2) Scientific—dealing mostly with agriculture, astronomy and domestic economy.

(3) Humorous—for temporary amusements.

It is proposed to give here some of the proverbs having agricultural basis, which are prevalent in the Hindi Speaking parts of Central Provinces, specially in the Chhatisgarh division

१. जहँा बूडे हाँडी--वहाँ उपजे खाँडी

Wherever the fields are watered so much that a *Handi* (earthen pot) dips, the field yeilds *Khandi* (of rice).

२. तेल फूल माँ लइका बाढै, पानी मा बाढ धान।

बात बात माँ रेंध बाढे, खिलवा माँ बाढे कान॥

Children grow by careful nursing, paddy grows in water, quarrel grows by discussion and a hole for earring is widened by a round piece of pith.

The above two deal with watering. There are proverbs which give the actual number of waterings and many details in that connection. As for example,

तीन पाख, दुइ पानी।

आँई कुटकदे रानी॥

Kutki (one of the lower millets) requires for a complete crop a duration of three fortnights and two waterings.

Then there are proverbs which deal with weeding. The grasses and plants, the presence of which is detrimental to particular crops, are mentioned in many interesting ways.

बात बात माँ बात बिनासी;

खेत बिनासी काँसी।

Work spoils by much talking, while a crop spoils by *Kans* (Kans).

A dialogue between two weeds giving a warning to cultivator of their action on the crop is full of humour.

मदा मदाई !
का गुम्मा भाई ?
जौन खेत माँ हम तुम जाई
तहाँ न हँसिया जाई.

Gumma or Kumbha (name of a weed) addressing his companion *Mada* (another weed) says—
Dear *Mada*;

What do you want me for, brother *Gumma* ?
Gumma further says:—You should be well aware of the fact that a sickle never goes to a field (to reap a harvest which we both happen to visit.)

Sowing time of every kind of seed is fixed. Proverbs like laws make village cultivators aware of the exactly right time when a particular grain ought to be sown.

पुक्ख की ब्यासी रुक्ख ।

Paddy sown in *Pushya Nakshatra* grows high like a tree.

पुक्ख (पुष्य) पुनर्वसु बोइये धान
अश्लेषा बोउनी से हानि

Paddy should be sown in *Pushya* and *Punarvasu Nakshatras*; sowing it in *Ashlesha Nakshatra* will result in loss.

Methods of sowing in cases of particular crops have not been left unmentioned.

घन खेती और विरल कपास !
टपका जोंधरा लगे अकास ॥

Paddy if sown densely, cotton seed at distances, and barly by broad casting grow to touch sky.

Telling about the importance of manure, a poet Says—

लोक टरै जमलोक टरै, पर ठारे टरै नहिं पाँस यो कूरा.

The laws of world or of heaven may fail to be true, but a heap of manure shall never fail to be true to its effect, even by making endeavours.

Then some warnings to cultivators.

जो जेठ मास माँ सोवै।
सो कार्तिक बैठिके रोवै॥

One who does not prepare his fields in *Jeshtha*-the season for cultivation and sowing Kharif crops-and goes to enjoy a sleep shall weep in *Kartika* which is the time of reaping the harvest.

तरहे कार्तिक तीन असाढ

One may afford to be late by thirteen days in *Kartika*, but cannot be late, without serious risk, by more than three days in *Asharha*.

There is a time limit for gestation period of every domestic animal, and proverbs will hint that also.

नवयें नारि, दसवें कलोरी
ग्यारहे भैंस, व बारहें घोरी.

The gestation period is nine months for a female, ten for the first calving of a cow heifer, eleven months for a she-buffalo and twelve months for a mare.

Then there are some superstitions attached to the calving of particular domestic animals during the particular months of the year.

सावन घोडी, भादौं गाय
माघ मास माँ भैस बियाय
आप जाय या किसानै खाय।

It is inauspicious for a mare to beget in *Shravan*, a cow in *Bhadrapada*, a she-buffalo in *Magh*, on such coincidences either the animal herself suffers or some misfortune attends the owner.

Proverbs dealing with agricultural astronomy are many They suggest the weather conditions in future, looking to certain present conditions.

जेठ चलै पुरवाई । तौ सावन धूरि उड़ाई ॥

If eastern wind blows in *Jyeshtha*, there is danger of falling of rains in *Shravan*.

जेठ परीवा बूँदीं परै,
(तो) चहुँ दिस परै अकाल ।

A famine is sure to occur if it rains on the *Pratipada* of *Jyeshtha*.

शुक्रवार की बादरी रही शनीचर छाय ।
जाय कहो एतवारसे, सोम न खाली जाय ॥

If the cloudy sky of friday continues to saturday, it must rain either on monday if it fails at all on sunday.

दिनभर बद्दर, राति निबद्दर,
बह पुरवैया झब्बर झब्बर,
घाघ कहै कुछ कारण होई,
कुंआ का पानी धोबी धोई, ।

If the sky remains covered with clouds during days and clear during nights, and also the eastern wind blows, some danger must follow, says Ghagh, that is the washerman shall have to wash in well water.

जब बरसे उत्तरा, भात न खाय कुतरा ।

Whenever it rains in *Uttara Nakshatra*, paddy grows so plenti-fully that even dogs begin to hate cooked nice,

मघा के बरसे ।
माता के परसे ॥

The field is satisfied when it rains in *Magh*, as a son is satisfied when a mother serves him food.

जो पुरवा, पुरवाई पावै ।
सूखी नदिया नाव चलावै ॥

If eastern wind blows in *Purva Nakshatra*, it rains so much that a dry river requires a boat to cross it.

माह महाउत, पूस निहोरे
फागुन बरसे नौखर श्रोरे ।

Rain in *Magh* is good, *Paush* still good, but that in *Phalguna* is associated genrally by a hail storm.

There are some general teachings to farmers.

रोठ मोठ बैला राखे, कमिया राखे भारी ।
रवी मुँह के घर राखे, हँसत बदन के नारी ।

One should possess strong bullocks, hard working servants, a house facing east and an ever cheerful wife.

झाँकत खेती
मागत रीन (ऋण) ।

Crop should be watched and debt should be demanded after short intervals.

Some poems of poets like Tulsidas, Kabirdas, Girdhardas and Ghagh have also become pro-verbs, though most of these proverbical poems are from ordinary village folk.

Thus we see that almost all the necessary aspects of agriculture have been dealt with. If possible, I shall try to amuse the readers with many more poverbs in some other number of our College magazine in near future.

Position of Entomology in Indian Agriculture.

(J. L. Khare, B. Sc., F. E. S.)

(*Continued from our last issue.*)

Here in India very simple measures also are not adopted because in most villages many of the farmers believe supernatural causes of insect outbreaks,they think that the curse of God should run its natural course At the same time there are others who resent to faith cures such as charms, mantras, magic etc. in the belief that the curse may be avoided or cleared. One reason for continuing such practices in spite of oft failures is that in some cases of pest outbreaks, the time of the disappearance of the creatures in soil or otherwise due to their peculiar habit synchronises with the apparent inactive period soon after the faith cures are adopted But the farmer does not know that those disappeared then, will again appear in still larger numbers after a lapse of a few weeks. Measures based on the study of the pest when suggested are laughed at because they happen to be so simple. Those advocating such means of control are blamed for not finding out any magical cures for checking all sorts of pests at one stroke which is hardly ever possible.

I quote you two examples one obout the cotton boll weevil of America (Mexico) and the other is the Rice stem borer in Japan Both the countries have spent time, money and labour in investigating these two insects as thoroughly as possible, several experiments, were conducted to find out remedies including use of medicines fumigation etc. but the only measures which were found possible and within the means of farmers are good farming in the former and destruction of rice stubbles after harvesting the crop. Next difficulty is how to meet the situation. It is never possible that such remedies will ever appeal strongly to the farmers, but when

the position becomes perilous and the pest is likely to be a national calamity, the state intervenes and compels by enacting laws and regulations the farmers to adopt the measures suggested. There are several instances showing the intervention of the State in such matters. By quoting the above instances I only wish to bring home to the educated class and the farmers the extreme complicated nature of the crop pest problems and several difficulties an investigator has to overcome in solving them. Whenever the question of fighting out the pests of staple crops arises the most essential thing required for the success of the remedial measures, is the cooperation of the cultivators .Attempts of individual cultivators will not prove as effective as they would be if under-taken in cooperation by all over affected area. Dissemnation of knowledge regarding the pest, their life histories and methods of control and spirit of cooperation are necessary for the measures to be adopted to be crowned with success. Thus the whole question of Economic Entomology in the present State of India Agriculture resolves into two factors viz-providing facilities for thorough investigation and the increasing the receptive capacity of the cultivators of the recommendations suggested to destroy croppests by means of demonstrations, circulation of pamphlet travelling Cinema etc. But to increase receptive capacity means to make the cultivators literate and that is only possible by spread of mass education and primary compulsory education When a cultivator begins to understand that the destruction of caterpillars feeding today will ensure safety to his new crop at a later stage and when he understands that insects like all other creatures are born out of parent and not of water and air and are endowed with a power of rapid development and growth not ordinarily found in other animals and ten caterpillars will give rise to several hundreds after a lapse of a few weeks time, then will be the time when he will come forward willingly and appreciate the value of working in cooperation in destroying the pests and thus save his crop. Then he will understand the complexity of the problem of pest control and will not expect wonders from the people engaged in such research and he will never compare the human dis-

eases with the crop diseases, both in cause and effect. I may also mention that there is a well organised Grass-hopper Destruction Society started some years back in the Bombay Presidency in Belgaon district and very recently a short report on the working of the society appeared in Times of India. The report concluded with a remark that the Director of Agriculture Bombay expessed that the working was very satisfactory. Another example of what cooperation can do in this branch of science is the locust campaign that was undertaken in Gujerat and Kathiawar, where the cultivators were induced to work together in driving the grass hopper from their fields. Photoes of the operation had lately appeared in the Illustrated Times of India.

There is another aspect of the crop problem that we can not afford to neglect in the present state of civilization when there are quick transport facilities by land, water and air. Agricultural product like seeds cotton, cuttings, tubers, plant etc. are carried from one country to another and there are great chances that different kinds of pest also travel with such commodities and establish in new lands. We have already got a list of such introduced pest from foreign countries and if strongest measures were not adopted many more would come. Recognizing the above facts the Government of India havepassed Pest act and it is in operation in India as in many other civilized western countries. Pest act can be applied into Provinces also and there has recently been an instance in Madras when for a certain pest of Combodia cotton the act had to be applied. Another instance of this application of Pest act can be seen in the case of American cotton. There is one insect called cotton boll weevil known in America for the last thirty years. It has gradually spread in all the cotton tracts to a greater or lesser extent. And since American cotton is purchased by the Indian Mills for spinning thread of higher count there is every danger that the insect will come in cotton bolls wrappings etc. from America and establish in cotton growing tract in India. To guard against the importation of pests the Pest act is in force. Under the pest act all American Cotton is shipped to Bombay harbour, when it is fumi-

gated with Hydrochloric acid gas and then the consigners are allowed to take delivery of that cotton. The merchants are required to give intimation to the customs office a fortnight before the date of arrival of the consignment and are required to pay the chargesof fumigation.

To summarise the present situation of Entomology relating to present Agriculture is that several crop pests are being investigated as fully as possible so far as the technical staff and facilities are available. In the case of staple crops the measures of insects control are most cultural methods and other methods not involving the use of insect poisons. Latter are not within easy reach of the farmers and nct economic. Under such conditions cooperation of the farmers is urgently required. In the cases of intensive cultivation and highly remunerative crops and on small scale insect poisons are practiable and are recommended when sought for. In India evolution of the modern scientific methods must progress step by step and it will be far from perfect for many years to come. From fatalism and faith cure to crude measures and from the latter to intelligent and effective methods is a gradual progress which has to be effected with a sound ground work of Agricultural mass and primary education, so that the future Indian ryot will be able to connect intelligently these methods with the habit of different pest and then be in a position to develop or discard the practices of past generation. At the present moment which can be described to some extent as a transition period such new methods, worked partly by investigation and partly by the accumulated experienced of pest ages in raising crops successfully under different climatic conditions and other environment, are suggested as are only economical and practical.

Modern Implements

(Kartar Singh Cheema, L. Ag. A. E., Mccha. E.)

(Continued from our last issue.)

(b) The farmer himself

The present tendency of the farmers is to relax their efforts and give up all active part in the cultivation of their land, the moment they can see their way to do so. Instead of directing and supervising the labour engaged on his farm, we find him sitting idle and leaving the work to the hired servants, it is clear that they are simply an incuberance to the land. Contrast this attitude with the American farmer, who wrings a hard living from the soil. A single man works the whole farm with the temporary assistance at the harvest time. His work is very strenuous and continuous and year by year he is able to invest fresh money in his holding, and thus the large areas which were wastes a short time ago are now covered with prosperous home farms. Or take a man in the same locality in California who has an irrigated land of 20 acres. He is generally worth one lakh, yet he not only works on the land himself but frequently does the whole of the work; his hours being from sunrise to sunset. He does not disdain to work for hire in any spare time that he can fetch from his farm engagement and will thus provide himself with an additional capital for the development of his land.

In India no man worth Rs. 20,000/- engages personally in the field labour on his own farm nor does any farmer worth Rs. 5,000/-employ his spare time in working for hire. It may be said that the American farmer can not get labour hence he has to work whereas the Indian farmer has labourers available so he engages. The cry nowadays is that owing to the rise in wages, the position of the middle class cultivator who gets his work done by hired labour has become very difficult. It can be said that if the wages for the field labourers were to rise as high as Rs. 2/- a day,

this class of cultivator would probably see the advantages of performing for himself most of the work for which he now pays wages and his labour bill would go down instead of going up.

(c) The use of labour saving machinery

A successful industry must aim at decreasing the bill of production of his farm by employing the best labour saving machinery. A man with a pick axe can dig an acre in two or three weeks—give him a plough and a pair of bullock he can finish in a day—give him a tractor and his out put can be four to five acres a day. The eradication of " Kans " can be carried out by hand digging for Rupees 80/-, Rs. 45/- by engaging bullock power and Rs. 20/- (including interest deprecia-tion charges) by tractor. The sickle is superseded by the reaper and flail by the threshing drum and the output per man is increased thereby. Not only the output is increased, but the operations are carried out more quickly which in our changable climate is of greatest importance in both the cultivation and sowing operations.

(2) Increasing the yield per acre.

There are three main factors for the increased crop production and they depnd upon the skill of the farmer.

(i) Cultivation.

(ii) Manure.

(iii) Seed

Of all these we are chiefly concerned with cultivation only.

The Indian cultivator is really working at a great disadvantage owing to the ineffective agricultural appliances. His tillage implements do not kill out weeds thoroughly; nor can they be of use for ploughing under weed and other forms of leaf manuring when that is necessary. Of all the implements in common use in India, the country plough is probably the most ineffecient. It is made up

of piece of wood shod with an iron point which constitutes the share. It is fitted with a wooden beam and is drawn by one pair of bullocks. Having no mould board it stirs the soil without inverting it and having no cutting parts it does not eradicate the weeds. The argument advanced against the introduction of iron ploughs and other improved implements is that they are generally heavier to pull than those in common use, and are not therefore suitable for the draught cattle of this country.

The implements are appreciably lighter in draught as a rule than those which they are replacing. The M. S. N. plough which is so very popular in the rice tract weighs 34lbs. and can be drawn by a pair of ordinary bullocks. Its efficiency over the Deshy plough is an acknowledged fact; I myself compared its effects on the Hindoria Demonstration farm in Damoh District when it was started in the year 1916.

The site for this demonstration farm was obtained on rent without the least hitch as the cultivator could not grow any other grain except kodo and kutki.

Two plots were laid out of one tenth of an acre each and ploughed twice with Deshy vs. S. M. S. N. plough. Each plot was given one cart load of manure and local variety of paddy was transplanted in both the same day. During their period of growth same sort of treatment was given. A marked difference was noticed in the stand of the crop and the yield was 800lb more per acre in the case of M. S. N. ploughed over the Deshy one. In the following year the sale of this plough was most surprising and the department could hardly meet its demands.

Now let us turn our attention towards the heavy type of plough known as Turnwrest which is replacing the Berar heavy plough requiring two pairs of bullocks. It is becoming very popular in the black cotton soil track, thousands are now being sold there every year and some cultivators have of late year taken to

the system of ploughing land on hire with Turn-wrest plough after finishing their work on their own farms. Its efficiency over Deshy one is well established on the Nagpur farm and emphasizes the importance of deeper tillage. The difference in the cost of cultivation on the 2 plots on this farm was Rs. 3/12-on the average. The difference of wheat obtained was 156 lb. per acre worth Rs. 15/8/, showing the net profit of Rs. 12/4 on an acre after deducting Rs. 3/12 the extra cost of cultivation.

Being thoroughly conversant with all the circumstances of the change and its solution in the practice of Agriculture, we have to seek our way for the real solution out of the dilemma. Under any case no one will like to adopt different line of work till he is fairly aware of his future destination. Consequently it is most essential to learn the effects of modern implement over the present situation and the condition leading to the successful issue.

Effects of the change in power:—

The limits of human power are originally given by the bare hands and feet, which enable him to put that power to more effective use. With khurpi he can weed his field, with pick axe he can dig his field much more efficiently than he could do with his bare hands. Happy was the day when the discovery in use of power was taken from the long suffering and stupid domestic cattle. By this act man has become possessed of a source of power many times greater than his own body is able to yield and with that possession we find a development of implements such as plough, planker and so on. Practically entire work of agriculture is now effected by bullock or man power. In other countries, it is not so now, as they are utilizing the mechanical power such as oil engine, tractors and sickles etc. In fact the cultivator will remain no longer "the man with khurpy," but he would be a well trained intellectual man.

Physical and mental changes.

It is not very difficult to realize that a great change for the better will take place in the physical and mental nature of the farmer,

It will be easier for man to sit on modern harvester, watch the machine and drive the bullocks than to work all the day long with a bent back, stuffing along with sickle in hand. How much easier it will be to handle the modern crop, though much larger, with the modern threshing machine, where the bundles are simply thrown into the feeder, than to spend days after days with a bullock treading method. The farmer will be able to finish his work in a short spell of time and still will have enough of leisure to plan his business and to think of improvemments.

Length of the working days.

One of the marked effects of the modern machinery will be shortening of the length of working days. At present the work is done by hand method. The day during busy season is generally from early in the morning till late at night. Thus often about sixteen hours a day are spent in the field, but in the era of the machine it would hardly exceed ten hours a day.

Increase in wages.

Some years ago plough men were engaged on Rs. 3/-per month and within the past ten years or so since the rapid introduction of improved implements in some parts of India the same plough men are being paid Rs 16/-. I know of a farm cooly who was getting -/2/- a day some ten years ago. In the mean time he happened to pick up machine work during the employment in the same place and is now drawing Rs. 50/- per month.

The labour of women.

Woman was the first Agriculturist as the history relates. She is required to help the many operations of the farm. When the machine will have its influence in Agriculture, undoubtedly the women will be relieved and shall find ample opportunity for the "Home industry." Eg.—soap making, butter preparation, sewing poultry keeping etc,

Percentage of population on the farm.

Although there is already a steady decrease in population due to higher wages in the manufacturing and trading centres still more the population will fall off when one man with the help of a machine will be able to do for six. The same case is observed in U. S. America.

In 1800 B. C.— 97 percent on the farm
„ 1846 „ — 90 „ „ „ „
„ 1912 „ — 35 „ „ „ „ and so on.

The causes of production and decrease towards the cost of production have been fully discussed in the previous pages.

Quality of products.

Machinary is sure to improve the farm products over hand methods prevailing till now. Many grains are sown at nearly the proper time owing to the fact that the machine methods are much more quicker.

By hand methods the crop does not get sufficient time to ripen. To finish the harvesting in time it is necessary to begin before the grain is fully ripe and hence it remains shrinkled or otherwise when dead ripe lot of wastage is experienced in the field.

In short, there will be great change by the introduction of the machine methods. It has been said that chemistry and engineering were of supreme importance in the conduct of the Great War, and it can be repeated without exageration that these sciences are also of supreme necessity in carrying out the business of Agriculture. The influence of machinary on the farm will relieve the cultivator much of drudgery and make his work moreeasy and hours of service short as now desired by all without exception. It will stimulate his mental faculties, give him an equillibrium of effort to mind and body, make labourer a more efficient worker—a broader man and better citizen.

Selection of implements.

The selection of the implements and the prospects of their proving of economic value on the farm are matters for the cultivator to decide. If he has a mechanical knowledge, he will, when inspecting a machine, be able to form an opinion as to its value for his conditions from a mechanical as well as from a farming stand point. How extensively the machinery may be used on any farm will depend largely on the following five points:—

(1) Size of the farm
(2) Kind of pro-duct
(3) The labour supply
(4) Efficiency of the mechine and
(5) Availability of its spare parts

(1) *Size of the farm*:—There is a machine for every kind of farm activity such as tilling, pulverizing, levelling, sowing, harvesting etc. Ploughs, harrows weeders, plankers, drags, and cultivators are tools used for tilling the soil. There are several kinds of ploughs such as Riching, Gang, and Disc ploughs. Sowing machinery consists of seed drills of various kinds such as:—Disc Hoe, Suffolk types and so on; other machinery besides above mentioned are manure spreader, sillage cutter, chaff-cutter, threshers,-crushes, gins, presses, pumps and various kinds of oil engines of stationary and traction type.

If a small farmer tries to have all in the list, he can not use them enough for the investment and it will be too great a cost per acre and at the same time if it goes without machinery, the loss of time and yield will be even more serious to consider. The more efficient and numerous machines become the larger our farm should be. The cost per acre for use of machinery would be more in case of small farm i. e. Rs. 5/—agaiust Rs. 2/-on the large one.

Most of the common farm machinery can be used profitable on a 200...300 acres farm and only a few selected ones on the small farm of 25-60 acres.

(2) *Kind of product*:–Machinery suitable for the production of any particular crop viz. wheat, cotton, sugar cane etc. will have all the labour saving implements ensuring their usefulness for that very crop, will be a better investment.

(3) *The labour supply*:—If the labour available is dear, scarce and especially unprocurable due to the competition at the important times of farm operations there is no other way but to seek the help of the machine which will ultimately solve the problem.

There will be more or less saving of time,-money and reduction in the cost of production.

(4) *Efficiency of the machine*:-It depends on its make. If it is simple it will last long and if complicated one be soon shattered into pieces for it is difficult to keep it in order so long a special man is not kept to look after it. There is no stability of certain machines as they have not yet been put to trying and their changes and modifications are going on every year. This is the case with every branch of machinery. The motor cars, bought a few years, ago went out of date because of improvement made before they are worn out.

With machinary as well as with anything else, the safe plan is to " Be not the first to buy the new untried nor yet the last to lay the old aside. "

If one has the money he may do some of experimenting to his environment and then bring a boon to the neighbourers.

(5) *Availibility of the spare parts:*—This should be looked in first. If the farm from whom the machine is purchased does not assure of the spares then it is not safe to go in for it. Some important spare parts of the machine purchased must be bought along with the new machine. These will be very helpful at the time of unexpected break-down. The time for break-down is also such when there is a greater rush of work and important operation in hand.

Means of securing efficient and economical work out of Agricultural mchinery.

(a) Maximum use in a year; and then hiring out a machine.
(b) Getting personally acquainted with its mechanism and repairs.
(c) Proper handling when in use.
(d) Caring when not in use.

(a) *Maximum use in a year and then hiring out a machine:*—For instance, the depreciation on a harvesting machine amounts to Rs. 45/- per year.

Interest, housing and caring will usually bring the cost of Rs. 60/- per year. If there are only 20 acres of wheat to cut, this will bring the cost of Rs. 3/- per acre, beside the time and labour.

Demand the rate, which is usually cheaper than is required to cut wheat by hand or hire a neighbour to cut it. No one can afford to buy a harvesting machine at this rate. For this reason the machine should be hired at prices so low that may appeal every one to use it.

(b) *Getting personally acquainted with its mechanism and repairs:*- It is not sufficient to have a machine, on ones farm. Some one on the farm must have an adequate knowledge of the construction, of the wearing parts and of reasons for break down and this some one should be the farmer himself. As to stoppage, necessitating outside advice and transport of the machine to the nearest repair shop means loss of valuable time and the loss of farmer's temper, as he is apt to blame the machine or the workman, when the blame should be on himself for either not being thoroughly conversant with the details of the implement or being unwilling to pay such wages as to attract trained persons. It would pay many farmers who have no knowledge and often an aversion to machinery and who have in use a number of implements, tractors, oil engine etc. to keep a machanic whose time would be fully occupied in repairs both when they are working and when they are not in use.

(c) *Proper handling when in use*:—It too often happens that the operator of a machine will take it to the field for use when it is out of adjustment or when certain teeth or screws are out of place; this soon results in a permanent injury and if continued the farmer finds it necessary to purchase a new machine. The operator should understand the working of a machine and be able to adjust them properly before using. Even a screw or bolt becomes loose it should be tightend, and the bearings should be kept well oiled, so that all the parts should work smoothly.

A well equipped work shop on the farm where minor repairs can be made is useful in keeping machinary in good condition. But it shonld not be too near to any important farm building, because of danger of fire from the forge.

(d) *Care when not in use.*

(1) Housing:—An implement shed will often double the life of the machine, while exposure to all kinds of weathers shortens, materially not only the life of the machine, but its usefulness as well. Machinary housed in an implement shed and oiled well before put in the shed may be used efficiently the day it is taken out for use, but a machine which is rusty gives much trouble, often results in unnecessary repairs and will not do efficiently the work for which it is intended. An implement shed should be built high and dry, which pays for itself in two or three years.

(2) Repairs:—Ordinary repairs should be made when needed but some repair work may be done in the rainy season when the work is slack. When implements are put in the shed for rainy season, they should be looked over carefully and all parts needing repairs should be noted on a chit and the chit should be tied to the machine, so that when repairer comes no time is lost in learning what part needs to be repaired.

(3) Painting:-not only protects and preserves it but improves its appearence and creates respect. Iron and steel are protected

against rust by paint and the wood is protected against decay. Both wood and steel remain stronger when they are painted. A good grade of paint should be used in painting the farm machinery.

(4) Proper lubrication protects against wear of the important parts of a machine and also lessons friction and therefore the pull. Proper lubrication is the cheapest and the easiest way to keep the machine in good running order. The kind of lubricant to be used depends upon the pressure, temperature and speed of the parts intended.

Eugenics.

(K. R. Sontake B. Sc.)

Eugenics is defined as the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally. Francis Gatton is the pioneer of this study. It is he who first pointed out that humanity is capable of vast improvements not vicariously but by it's own endevours.

Every modern educated man believes in the theory of Evolution and agrees with evolutionists when they say that man by varinos modifications has risen from a lower and simpler type. There is nothing to prevent us from saying that allowing the process of evolution to go on unobstructed, that the man will still rise in the future. Formerly only the process of selection led to the survival of those who were gifted with special qualities and extinction of the less fit in the fierce struggle for existance.

Modern civilisation and humanitarianism have effectually set aside the action of natural selection. The result at the present day indicates that the upward progress has already almost ceased

and there is every danger of finding that a downward journey has begun. This is an inevitable conclusion to those who accept the well established facts that men are not born equal and (2) that although everyone is free to become the father of a family, yet the tendency to bring up large families is becoming relatively smaller among those classes of society which we must regard as the best endowed, both physically and mentally

Are there any practical means by which this tendency to degenerate can be combated or changed into an upward bias ? In order to discover such a means it is needful to gather all possible information with regard to the primary factors of organic evolution in the human race that is to say variation and heridity. Gatton showed that mental and moral characters are inherited as strongly as physical characters, a fact which is by no means generally appreciated as it should be.

Many people believe that the progress of the race can be directly and permanently affected by improvements in education and the amelioration of social condition. It is certain that qualities of any person, depend upon health, character and up-bringing as well as upon his hereditary endowments.

No doubt nurture plays a good deal of part in improvement, but if the seed itself is of inferior stock no remarkable improvement can be expected. For though only under favourable conditions of water, temperature and fertile soil a good seed of a plant can germinate into a healthy plant; but any amount of moisture and other favourable conditions is not able to rear a seed into a healthy plant if it be of the inferior stock.

You may educate generation after generation and yet the starting point from which each individual has to begin his struggle upwards may remain the same even though each may struggle a little further than the one who came before him. On the other hand we have all of us met a few of those happy people to whom it seemed second nature to do the right thing and for whom the

difficulties of nature appear to be no menace. These qualities are those of nature and not of nurture; and their children will inherit them. Some are born great, some achive greatness, some have greatness thrust upon them. But those who are born great, meaning not those in high position, but great in themselves are the men and women to whose descendents we must look for the future greatness of mankind.

In social life, important as the education, sanitation and the like may be, their effects are strictly limited. The relative birthrate of good and bad stock is the fundamental factor. For clean-ness of explanation we may divide newly married couples into three classes with respect to the probable civic worth of the offsprings. There would be a small class of desirables, a large class of passables, and again a large class of undesirables. It would clearly be advantageous to the country if social and moral support as well as timely material help were extended to the desirables and not monopolised as it is apt to the undesirables.

Formerly, the natural fecundity of all classes of society was allowed to flow on unchecked, even under these circumstances larger families were born to the poor than to the rich because the poor marry early and improvidently, but the greater death rate amongst their children prevented the poor strata of society from increasing relatively to the rich. Now, however the rich limit their families to a number which they can easily support and this number tends to become smaller and smaller as heavier taxation is levied to provide for the survival and education of the large families of the poor. Eugenists contend that the state is in this way deliberately cutting off its best stocks which raised it to greatness in the past, and on the continuance of which its whole future depends.

Against this whole policy the Eugenics, Education Society has raised a continuous protest and the Eugenic Record office has published a valuable record of bulletins showing the aweful progeny of the criminals, paupers and lunatics, that have sprung from a single worthless family during the last 100 years, and some Amer-

ican States have passed some what hastily concieved laws designed to cause criminals and idiots confined in a state of prison to be sterilized.

If these better class of men had more children on the average than are produced by people in inferior stations, it would mean that the children of the comfortably situated will have to be contended with positions some what inferior, on the average to those of their parents. This is precisely the condition of affairs most desirable from the point of view of race improvement and from that of national efficiency, since any given position will be recruited from better and not from worse class than the one that previously occupied it. Such measures can only be justified by making at the same time every possible effort to correct these dangerous differences in the incidence of birth-rate. Legislation in these two directions ought to go hand in hand. Indeed, the improvement in the supply of children ought for every reason to precede the improvement in the care and the education of the children, for if the state cares for the children it has a right to insist that the supply of children shall be the best possible and this is far from being the case at present.

Thomson in his book on Heredity in regard to deliberate restraint on the part of great men says " Is there any truth in the inference that failure in reproductive power is an expression of nature's verdict against dis-social isolation of privileged classes, against every self contradictory denial of the solidarity of the social organism ? In any case is there not need for getting rid of selfishness which keeps some of the fitter types from recognising that they have another great contribution to make to the race besides their work ".

Student of Eugenics should try to discourage fertility of the inferior stock, encourage increase, in the fertility of better stock. " Not a few medical men writes " Herson, " are urging that propogation among the obviously unfit—those affected with the definite

hereditary taints, the imbeciles, idiotic, the sufferors from syphilis tuberculosis should be authoritatively restrained. Can it be urged that a proceeding would be unduely tyrannous ? Surely if these people under the irrevocable laws of heredity—if they only know them would be themselves unwilling to hand on a tainted existence to future generations ! If there are people so obcesed that this argument does not appeal to them surely such a crime against Society as a marriage of this kind is at least as open to coersive treatment as many of the acts which are treated as criminal by existing laws. We elaborately prevent and punish paltry offences against property and yet deliberate crimes like marriages between the unfit are not recognised as criminal.

The object of Eugenics according to Galton is two fold, one is to check the birth rate of the unfit instead of allowing them to come into being, though doomed in large numbers to perish prematurely. The second object is the improvement of the race by furthering the productivity of the fit by marriages and healthful rearing of their children. Natural Selection rests upon excessive production and wholesale destruction, Eugenics upon bringing into the world no more individuals than can properly be cared for, and those only of the best stock.

No man is responsible for his own being--nature and nurture have made him the being he is, good or evil. But here science steps in crying, let the reprive be accepted but next remind the social conscience of duty to the race. No nation can ever become great unless dominant fertility be associated with the mentally and physically fitter stocks. The reprive is granted but let there be no heritage amongst the unfit if you mean to preserve a virile and an efficient race.

Ref:— Loch R. H.—*Variation on Heredity and Evolution*
Thomson.—*Heredity.*
Leonard Darwin—*The need of Eugenic Reform.*

Some useful Agricultural Implements.

We as workers for the improvement of Indian agriculture are really concerned very little about the merits of different tractors or whether a reaper and binder can be used in India and the cost of threshing wheat with a Marshall's outfit; because these, and such costly and complicated machines, are utterly and absolutely beyond the scope or range of 99 per-cent. of the cultivators of this land. What the ryot wants is some small, but sound improvement that can be incorporated into his present condition of living and working; and not a thing that demands first enormous capital, large holdings or their equivalent, mechanical sense, in short the conditions of Australia or Western America. His small scattered holdings, tiny plots, poor bullocks, intense poverty and utter lack of mechanical knowledge, are conditions we must accept; and, facing them, concentrate on those improvements e. g. better seed, new manures, etc., that can be adopted into those conditions and which, once accepted by that 99 per-cent. of typical cultivators, bring enormous aggregate good to the country as a whole.

This is as true of implements as of other lines of improvement; and our first and most pressing duty is to try and supply simple and cheap equipment that can be adopted into the present system of cultivation, but will profit the ryot by enabling him to do better and more varied cultivation, with less expenditure of labour of man and beast. The implements mentioned below fulfil these conditions in that they are cheap, adopted to bullock draft and small plots, and mechanically simple.

The Bihar cultivator, either in the simplest 3-tined form for tracts where bullocks are small, or in the 3/5 tined form for tracts where bullocks are large, will do faster and cheaper all the work done by the country plough; and will in addition, inter cultivate and partly ridge up crops grown in lines. From the extraordinary

utility of this implement on farms at Sepaya and at Sewan and the interest shown in it by local' cultivators—six have already been sold and there is it can be said a small waiting list of people who have each deposited Rs. 2, to ensure getting one-that the Bihar three -tined cultivator, if marketed on a sufficiently large scale to be really cheap—at present Rs. 10 to Rs. 15—has a real chance of rivalling the country plough in its appeal to the general mass of cultivators The firms so far interested are Messrs Arthur Butler and Co. of Muzaffarpur, who have made a very simple and, sound three-tined boltless model, the Saran Engineering Co. Marhowrah Saran and Messrs D. N. Ghosh and Sons of 84-A, Clive Street, Calcutta, who have supplied copies of the 3/5 tined model; all these firms would, welcome enquiries.

The Bihar ridge plough enables the ordinary bullocks to be used to open up furrows for planting cane, potatoes, etc; and to earth up maize, cotton, cane, potatoes, etc and eliminates the *kodali* (spade) from this class of work. So far only the small size with fixed mouldboards to throw ridges 2½ feet wide is available; and that can be supplied either complete, or for fitting to the cultivator by Messrs. Arthur Butler and Co., Muzaffarpur.

The Bihar plough enables the cultivator, even with small bullocks and in small plots really to plough his land. Messrs Arthur Butler and Co., are now making samples of a production model based on this and likely to be very satisfactory. They will, welcome enquiries on this also. It is hoped that any one interested in obtaining ploughs, cultivators and ridge ploughs, really built for work under the peculiar conditions of this country will give this firm a trial order.

Whenever the improvement of Indian agriculture is discussed we are met by the same vicious circle, poor cattle, poor tools poor crops, little money, little fodder and so round to poor cattle again. The implements described can be bought for the little money, and drawn by the poor cattle; and their use will result in better and

bigger crops and so in more fodder and hence better cattle. By them the vicious circle can be broken; and in its place be forged a steady continuous chain of improvement in the lot of the Indian ryot. It only requires the Departments of Agriculture to test them sufficiently to learn their value, and to demonstrate them widely, to ensure the demand that will bring the competitive supply and the low price, and possibly in addition to a great benefit to the cultivator also a new industry to India.

—*Agricultural Journal of India.*

Royal Agricultural Commissioners' Report.

(Some Recommendations) †

General observations.

No substantial improvement in agriculture can be effected unless the cultivator has the will to achieve a better standard of living and the capacity, in terms of mental equipment and of physical health, to take advantage of opportunities which science, wise laws and good administration may place at his disposal. Of all the factors making for prosperous agriculture, by far the most important is the outlook of the peasant himself.

This is determined by his environment and it follows therefore, that the success of all measures designed for the advancement of agriculture must depend upon the creation of conditions favourable to progress. If this conclusion be accepted the improvement of villiage life in all directions assumes at once a new importance as the first and essential step in a comprehensive policy designed to promote the prosperity of the whole population and to enhance the national income at the source. The demand for a

† Times of India.

better life can, be stimulated only by a deliberate and concerted effort to improve the general conditions of the country-side, and the responsibility for initiating the steps required to effect this improvement rest with Government.

Rural uplift.

The realisation of this important truth has led, in recent years, to a large increase in expenditure on the departments concerned with rural welfare. None the less its force is inadequately appreciated by the Governments of India and by local Governments and that the necessity that the rural problem should be attacked as a whole and at all points simultaneously, is still insufficiently present in their minds. The failure to grasp the full significance of the proposition explains the absence of any co-ordinated attempts to effect that change in the surroundings and in the psychology of the peasant without which there can be no hope of substantially raising his standard of living.

If the inertia of centuries is to be overcome, it is essential that all the resources at the disposal of the state should be brought to bear on the problem of rural uplift. What is required is an organised and sustained effort by all those departments whose activities touch the lives and the surroundings of the rural population.

It is, no doubt the recognition of the need for co-ordination that has given rise in many quarters to the view that lasting progress is unlikely to be achieved unless in all provinces, the activities of the various departments concerned are co-ordinated by development boards advisory committees or officers charged with the specific duty of securing combined action towards a given end. Development boards exist in some provinces advisory committees in all. They are not without their value in bringing departments together and in interesting leaders of public opinion in departmental activities. But there are definite limits to the extent to which governments may properly or usefully delegate the performance of their functions. The responsibilities for framing policy, and for

combining the activities of two or more departments in order to give effect to that policy, must remain that of Government and of Government alone.

In Indian conditions a very special measure of responsibility in this direction falls upon the Viceroy and upon the Governors of provinces. The Viceroy can by the display of a personal interest in agricultural matters, forward the cause of India's premier industry. But the immediate responsibility of provincial Governors in this matter is the heavier, since the services most directly concerned with rural development are administered by provincial agency and since it is they alone who provide a link between the reserved and the transferred departments. The responsibility of the ministers in charge of the transfered departments, which include all those most directly concerned with rural welfare, is also a heavy one and they will need all the assistance that strong secretariats with senior and experienced administrators at their head can give them.

Need of public support.

But though it is the duty of governments to initiate a combined movement for the betterment of the rural population success on a large scale can be rendered permanent only if the sympathy, interest and active support of the general public can be enlisted. So vast is the population and so extensive are the areas concerned, that no resources which could conceivably be commanded by the State would be adequate to the task in hand.

Research organisation.

The report deals *inter alia* with the organisation of agricultural research, agricultural improvement and the subdivision and fragmentation of holdings, demonstration and propaganda, animal husbandry, forests, diseases of live stock and their control, irrigation, communications and marketings, the finance of agricultural co-operation, education, rural industries and labour, horticulture, and plantations and agricultural services.

After strongly expressing themselves on the inadequacy of measures adopted by Government for research the Commissioners hope that the time will come in India as it has already come in other advanced countries, when the indispensable part which a central organisation has to play in the fields of agricultural research and of rural development generally will be fully recognised. The report proceeds that with the undoubted demand for an increase in the pace of agricultural progress the time has even now come when there will be a general measure of support throughout the country for proposals designed to promote co-ordination of a more effective character than would be provided by the continued existence of the appointment of agricultural Adviser to the Government of India and by conferences of Ministers and Directors of Agriculture and meetings of the Board of Agriculture. It is essential to the advancement of agricultural research in India that Pusa should be brought into closer touch with the provincial departments of agriculture and the latter with each other. A new organisation is needed to connect Pusa and the provincial research institutes—an organisation to which both will stand in exactly the same relation.

An Imperial Council of Agricultural Research should be constituted, the primary function of which would be to promote, widen and coordinate agricultural research throughout India. It would not exercise any administrative control over the Imperial or provincial research institutions. It would be a body to which the Imperial and provincial departments of agriculture could look for guidance in all matters connected with research and to which such research programmes as they might choose would be submitted for criticism and approval. The object in proposing that such a body is to provide provincial governments with an organisation enhancing the whole research activities of the country, veterinery as well as agricultural, in which they can feel that they have a real and lively interest. That interest will undoubtedly be greatly accentuated if the Council is entrusted with the

administration of funds with which it can supplement provincial activities in the matter of agricultural research. It is therefore, proposed that the Council should be entrusted with the administration of a non-lapsing fund of Rs. 50 lakhs to which additions should be made from time to time as financial conditions permit. This is, the minimum grant which can usefully be made and so low a figure has been proposed only on the assumption that provision for the cost of existing institutions and for normal expansion will be met from central or provincial revenues as the case may be.

The Council of Agricultural Research and the Agricultural Research Fund should be constituted by an Act of the Imperial Legislature. The position of the Council of Agricultural Research in relation to the administration of the research fund would be analogous to that of the Indian Central Cotton Committee in relation to the funds raised under the provisions of the Indian Cotton Cess Act of 1923. Subject to such conditions as might be prescribed, the capital and income of the fund and any other funds received by the Council would be utilised in meeting its expenses and the cost of such measures as it might decide to undertake for promoting agricultural and technological research in the interests of agriculture in India. The powers of the Council would be regulated by rules issued by the Governor-General in Council in the Department of Education. Health and Land similar to those issued under section 10 of the Indian Cotton Cess Act. These rules would *inter alia* regulate the powers of the Council to enter into contracts and to appoint and pay officers and servants. They would further regulate the powers of the Council to incur expenditure and provide for the submission of the budget to the Governor General in Council for sanction and for the audit and publication of its account. It is hoped that the agricultural research fund thus constituted will in course of time be considerably augmented by private benefactions.

One of the most important functions of the Council will be in regard to the training of research workers and part of its fund

should be utilised in the provision of research scholarships tenable by students who have given evidence that they are capable of taking full advantage of the opportunity for intensive training in scientific research in agriculture. The Council will act as a clearing house for information and will establish bureaus for crops as well as for animal husbandry, drying and veterinary matters. It will take over the publication work at present done by the Agricultural Adviser to the Government of India and will arrange for sectional meetings of experts in particular branches of agricultural science. The commissioners do not contemplate that the Council should have research stations directly under its control or should have its own staff of experts. It would be for the Council to decide whether a particular piece of research work is of all India or purely of local importance; if the former, whether it can best be carried out at an imperial or provincial research institution entirely outside such institutions in a university by private individuals or even abroad. In order to bring the financial position of the Council into relation with the present Constitution it will be necessary to include in the Devolution Rules a declaration that the development of agricultural research by a central authority is expedient in the public interest.

Provincial Committees.

As a link with the Central Research Council, a Provincial Research Committee should be established in each of the major provinces which will work in close co-operation with the Council.

That the Council should consist of 39 members. Three of these would be whole-time members—the Chairman, who should be an experienced administrator with a knowledge, if possible of Indian conditions, and two eminent scientists qualified to represent respectively the interests of agriculture and animal husbandry. Of the remaining thirty-six members eight would be nominated by the Government of India. Eighteen would represent the provincial agricultuarl and veterinary departments, three would represent the

Indian universities, two would represent the Indian Central Cotton Committee and the planing community respectively and five would be non-official members nominated by the Council by reason of their scientific knowledge or the special qualifications, for the approval of the Government of India. The Chairman and the two whole-time members might be appointed for five years, and the other members for three years as a general rule. Provision should be made for extending these periods.

The most suitable headquarters for the Council would be those of the Government of India–Delhi and Simla.

On the formation of the Council of Agricultural Research the necessity for an Agricultural Adviser to the Government of India will disappear. This officer is at present the Director of the Pusa Institute. A whole-time Director will be required for Pusa who in addition to the administrative control of that Institute will also exercise administrative control over sub-stations, now under the Agricultural Adviser.

Successful Candidates

Annual Examination 1928

—:o:—

1st Year Degree Class.

1 H. K. Dass.
2 M. K. Nagmote.
3 B G. Chandel.
4 K. A. Ahmed.
5 R. A. Katakwar.
6 H. S. Dhalloo.
7 S. A Rahman.
8 L. B. Deshpande.
9 S. M. Khan.
10 J. N. Pimpalkhute.
11 N. P. Deshmukh.
12 A. D. Joshi.
13 H. N. Sharma.
14 R A. Uplapwar.
15 E. D. Pimpiikar.
16 Md. Akram.
17 B. R. Cheorey.
18 D. G. Kherdekar.

1st Year Certificate Class.

1 C. C. Tiwari
2 T. P. Dube.
3 R. R. Langde.
4 B. U. Lendhey

2nd Year Certificate Class.

1 N. B. Pradhan.
2 Cleophas
3 A. K. Chatterji.
4 P. B. Kharpate.
5 V. R. Deshpande.

2nd Year degree Class.

1 Bhimsing Govindsing Gahilote
2 Kishan Mohanlal Simlote.
3 Nilkanth Krishna Nerikar.
4 Pratap Bhanu Dixit.
5 Ramachandra Ganesh Jogleker
6 Ramesh Chandra Ghosh.

Compart.

1 Hatimali. (Mathe.)
2 J. N. Kelkar. (Agri.)
3 Kalooram Dubey (English)
4 Shanker Vithal Pokare (Agri.)

3rd Year degree Class.

1 R J. Kalamkar.
2 A. N. Karnik.
3 N. Z. Ahmed.
4 K. N. Phadke.
5 S. K. Waishampayan.
6 A. S Bakre.
7 W. R. Gupta.
8 N. K. Galande.
9 P. R. Dube.
10 S. N. Moosharam.
11 B. L. Kayastha.
12 D. N. Dass.
13 S. T. Patil.
14 S. M. Ali.

4th year Class.

1 R. B. Ekbote.
2 A. B. Dutta.
3 N. B. Pandhre.
4 R. S Sapre.
5 S G. Kolte.
6 G. G. Phadke.
7 D. A. Joshi.
8 C. L. Bedekar.